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SERIES
37XXX
VECTOR NETWORK ANALYZER

PROGRAMMING MANUAL

Software Version: 2.19

Anritsu

490 JARVIS DRIVE | MORGAN HILL, CA 95037-2809

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Electromagnetic Interference:

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Electrical Safety Requirement:

Product Safety:	IEC 1010-1:1990 + A1/EN61010-1:1993

Jeri Blasi
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5-SEPT-97
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This chapter provides sample program elements that demonstrate common 37XXX operations. These sample elements are useful as an aid in developing 37XXX programs.

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This chapter describes 37XXX functions that support operations typically required when in the remote-only (GPIB) mode. The commands described consist of data transfer, error reporting, SRQ/status reporting, 488.2 common commands, and synchronization.

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This chapter describes the commands used to implement certain system functions. They consist of hard copy, system state, save/recall, disk function, and diagnostics commands.

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This chapter provides an alphabetically-ordered, dictionary-type listing and description of all 37XXX GPIB programming commands. The listing for each command includes relevant details about the command.

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This appendix contains an introduction to the IEEE 488 Bus (GPIB). This material is intended to assist new users in understanding GPIB basics.

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This appendix provides a quick reference to all 37XXX GPIB commands. Each reference lists the command name, a brief description of the command function, and a reference to the pertinent Chapter in this manual.

Appendix C — 360B Compatibility Information
This appendix provides compatibility information for GPIB operation and programming between the 37XXX Series and the 360B Series of ANRITSU Vector Network Analyzers. It includes a listing of all 37XXX commands that shows the degree of functional compatibility between the 37XXX commands and the associated 360B commands.

Part 1 The GPIB Interface

This part consists of three chapters that describe how the IEEE- 488 (GPIB) interface is implemented within the 37XXX Vector Network Analyzer and how to perform basic GPIB communications operations.

***Chapter 1** – briefly describes the 37XXX GPIB programmer interface and describes the communication to and from the interface during remote-only (GPIB) operation of the 37XXX.*

***Chapter 2** – provides a tutorial for performing basic GPIB operations such as sending and receiving messages, synchronizing instrument operations, setting timeouts, and status checking.*

***Chapter 3** – provides sample program elements to familiarize the user with 37XXX programming techniques. They are also useful as an aid in developing 37XXX programs.*

Chapter 1
Series 37XXX GPIB
Programmer Interface

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Chapter 1
Series 37XXX GPIB Programmer Interface

1-1 MANUAL SCOPE

This manual provides IEEE 488 bus (GPIB) programming information and data for all models of the Series 37000 Vector Network Analyzer. It contains the entire command set for programming all features. Consequently, not all of the codes documented in this manual apply to all models within the series (371XXA, 372XXB, 373XXA). The reader needs to be aware of the feature set available within the model for which programming is being written. Feature set information is documented in the applicable operation manual (OM) for any particular model.

1-2 INTRODUCTION

This chapter contains a brief introduction to the 37XXX GPIB interface and programming environment.

1-3 RELATED MANUALS

All models within the Series 37000 Vector Network Analyzer product line contain an operating manual (OM) and a maintenance manual (MM) that is specific for the particular model series. This programming manual applies to all models within the series. Part numbers and manual titles are given below:

Manual Title	Part Number
371XXA Operation Manual (OM)	10410-00190
371XXA Maintenance Manual (MM)	10410-00192
372XXB Operation Manual (OM)	10410-00180
372XXB Maintenance Manual (MM)	10410-00182
373XXA Operation Manual (OM)	10410-00183
373XXA Maintenance Manual (MM)	10410-00185

1-4 REMOTE OPERATION INTERFACE

The following paragraphs describe the 37XXX facilities for remote operation.

The 37XXX fully supports the IEEE 488.2–1992 GPIB standard. All 37XXX front panel functions (except Power on/off and GPIB Test) can be controlled remotely using the GPIB commands listed in this man-

ual and an external computer equipped with an IEEE 488 GPIB controller. When in the GPIB operating mode, the 37XXX VNA functions as both a listener and a talker.

GPIB Setup Menu The 37XXX VNA GPIB address defaults to 6. This value may be changed via the Utility Menu key's GPIB ADDRESSES menu (below).

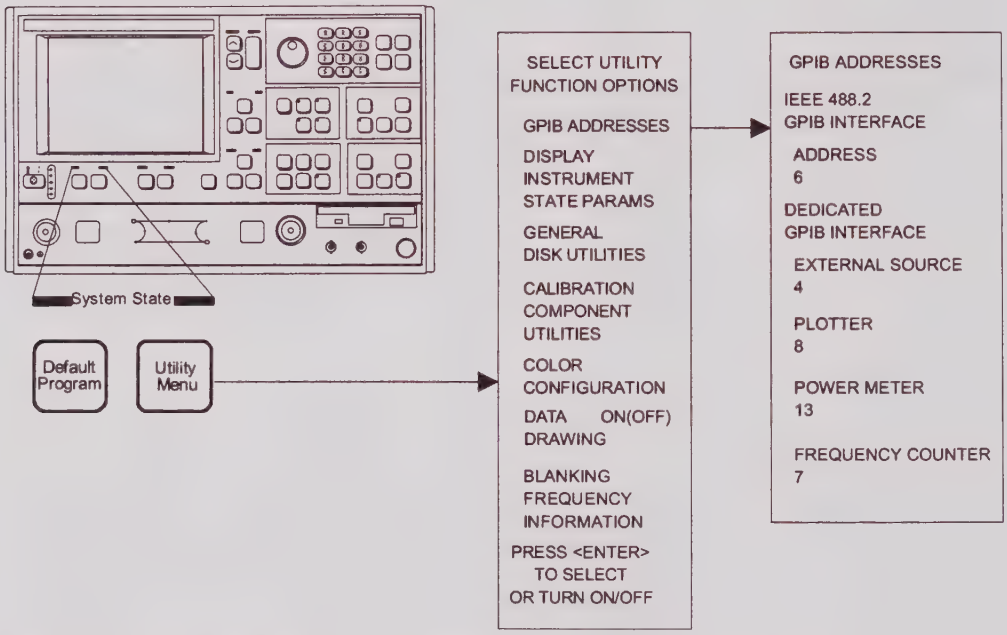
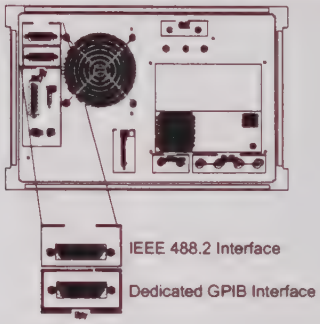


Figure 1-1. *GPIB Address Menu*

Interface Connection



Connect your external controller to the IEEE 488.2 GPIB interface connector on the rear panel (left). A pinout listing of this connector is contained in Figure 1-2.

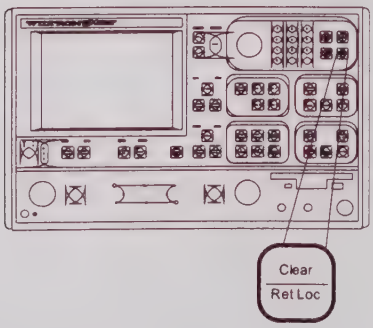
NOTE

Do not connect your external GPIB controller to the "Dedicated GPIB Interface" connector (located below the "IEEE 488.2 GPIB interface" connector (left). This dedicated GPIB port is used by the 37XXX to control external GPIB devices, such as a plotter, second frequency source, frequency counter, or a power meter.

The GPIB system can accommodate up to 15 devices at any one time. To achieve maximum performance on the bus, proper timing and voltage level relationships must be maintained. If either the cable length between separate instruments or the accumulated cable length between all instruments is too long, the data and control lines cannot be driven properly and the system may fail to perform. The following guidelines should be observed:

- No more than 15 instruments may be installed on the bus (including the controller).
- Total accumulative cable length (in meters) may not exceed two times the number of bus instruments or 20 meters—whichever is less.
- Individual cable length should not exceed 4 meters.
- 2/3 of the devices must be powered on.
- Devices should not be powered on while bus is in operation (that is; actively sending or receiving messages, data, etc.).
- Minimize cable lengths to achieve maximum data transfer rates.

Local Operation Key

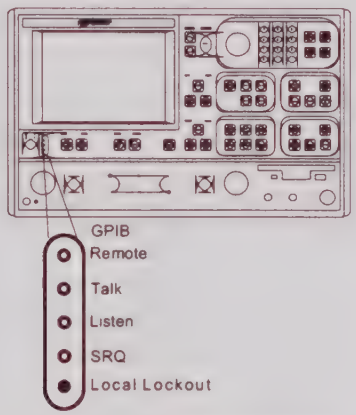


Press the Ret Loc key (below) to quickly restore the 37XXX to local operation. Local operation will be restored unless the 37XXX is programmed for local lockout; the Local Lockout LED indicator will be lit.

Pinout Diagram

PIN	NAME	DESCRIPTION
1-4	DIO 1 thru DIO 4	*Data Input/Output.* Bits are HIGH with the data is logical 0 and LOW when the data is logical 1.
5	EOI	*End Or Identify.* A low-true state indicates that the last byte of a multibyte message has been placed on the line.
6	DAV	*Data Valid.* A low-true state indicates that the talker has (1) sensed that NRFD is LOW, (2) placed a byte of data on the bus, and (3) waited an appropriate length of time for the data to settle.
7	NRFD	*Not Ready For Data.* A high-true state indicates that valid data has not yet been accepted by a listener.
8	NDAC	*Not Data Accepted.* A low-true state indicates that the current data byte has been accepted for internal processing by a listener.
9	IFC	*Interface Clear.* A low-true state places all bus instruments in a known state—such as, unaddressed to talk, unaddressed to listen, and service request idle.
10	SRQ	*Service Request.* A low-true state indicates that a bus instrument needs service from the controller.
11	ATN	*Attention.* A low-true state enables the controller to respond to both it's own listen/talk address and to appropriate interface messages — such as, device clear and serial poll.
12	Shield	Ground Point.
13-16	DIO 5 thru DIO 8	*Data Input/Output.* Bits are high with the data is logical 0 and LOW when the data is logical 1.
17	REN	*Remote Enable.* A low-true state enables bus instruments to be operated remotely, when addressed.
18-24	GND	Logic ground.

Figure 1-2. *Pinout Diagram, IEEE 488.2 GPIB Connector*



Remote Operation LED Indicators

GPIB Remote Indicators (above) signal operational status of the GPIB, as described below:

Remote:
Lights when the 37XXX switches to remote (GPIB) control. It remains lit until the unit returns to local control.

Talk:
Lights when you address the 37XXX to talk and remains lit until un-addressed to talk.

Listen:
Lights when you address the 37XXX to listen and remains lit until un-addressed to talk.

SRQ:
Lights when the 37XXX sends a Service Request (SRQ) to the external controller. The LED remains lit until the 37XXX receives a serial poll or until the controller resets the SRQ function.

Local Lockout:
Lights when a local lockout message is received. The LED remains lit until the message is rescinded. When lit, you cannot return the 37XXX to local control via the front panel.

Audible Indicators

A single beep is issued as follows:
(1) on a GPIB error,
(2) when a user warning is issued (see Chapter 12, Operational Error Messages)
(3) when a test limit line has been exceeded, if the limits testing beep function has been set (see Chapter 6)
(4) on system reset.

(5) any time the user's attention is required, such as at the end of a calibration step.

1-5 GPIB COMMUNICATION

The following paragraphs present a short summary of 37XXX GPIB communication. Subjects covered are program messages, separator/termination characters, status reporting, and GPIB error conditions and corresponding 37XXX responses. Refer to Chapter 7, Remote-Only Operation, for detailed description of these topics.

The primary GPIB messages that effect 37XXX operation consist of two major groups; Bus Interface Function messages, and Instrument Specific messages.

Bus Interface Function Messages

These are low level bus messages defined by IEEE 488.1. A discussion of these messages is beyond the scope of this programming manual. For further information, please refer to your GPIB controller documentation and/or to IEEE 488.1 Standards documents. Also refer to Appendix A at the end of this Programming Manual for a brief primer on the GPIB Interface. Table 1-1 summarizes some of the key Interface Function Messages and the 37XXX response to them.

Table 1-1. IEEE-488 Interface Function Messages

Interface Function Message	Message Function	Addressed Command	37XXX VNA Response
DCL	Device Clear	No	Resets the 37XXX GPIB communication functions.
SDC	Selected Device Clear	Yes	Resets the 37XXX GPIB communication functions.
GTL	Go To Local	Yes	Returns the 37XXX to local (front panel) control.
GET	Group Execute Trigger	Yes	Executes a string of commands defined by the IEEE 488.2 common command *DDT. A GET is also done by using the *TRG command (see Chapter 10, Command Dictionary).
IFC	Interface Clear	No	Stops the 37XXX GPIB from talking/listening.
LLO	Local Lockout	No	Disables the front panel RETURN TO LOCAL key.
REN	Remote Enable	No	Places the 37XXX in remote when addressed to listen.

37XXX Specific Messages

The 37XXX specific GPIB messages (also known as commands, queries, and mnemonics) are used to control 37XXX front panel functions. They also provide for remote only operations such as data transfers, status reporting and service request generation, error reporting, and instrument-to-application program timing synchronization.

Refer to Chapter 10, Command Dictionary; Appendix B, Quick Reference Guide; and Chapters 4-9 for information on all 37XXX commands. The commands are organized both alphabetically and by command function groups. There are many examples throughout this manual to assist you in learning and using a desired command.

Most 37XXX commands are three character contractions of their functional descriptions. Examples include: **OM1** (Output Marker 1), **IFV** (input Frequency List), **TRS** (Trigger Sweep), **WFS** (Wait for a Full Sweep), **OFD** (Output Final [display format] Data), and **PFS** (Print Full Screen).

Numeric parameter entry commands *must* be followed by a numeric value. These commands can optionally accept a units or suffix terminator mnemonic. For example, **SRT 2 GHZ** (set start frequency to 2 GHz.)

Query commands, typically ending in a question mark (?), are used to inquire about the state of a particular instrument function. Many 37XXX setup commands have corresponding query commands listed in the same section as the basic setup command. An example is the **MK1?** query. It *outputs* the setting of Marker 1 Frequency, where the **MK1** command *sets* Marker 1 frequency.

IEEE 488.2 Common commands, which always start with the asterisk character (*), are defined by the IEEE 488.2 Standard. They are used to implement many standard instrument GPIB operations such as querying when an operation completes, status reporting, self test, and querying the instrument identification string. These commands are described throughout the Programming Manual in the specific funtional group where they are used. A consolidated listing of these commands can be found in Table 1-2, item 12 below and in Chapter 7. An example IEEE 488.2 Common command is the `*IDN?` query (Output Instrument ID String.)

Separator Characters

Separator characters are used to delimit program message elements sent to or received from the 37XXX. The permitted characters: semicolon (;), comma (,), and space ( ) and their usage is shown below.

Character	Used to separate
;	Multiple commands and multiple output response messages.
,	Multiple ASCII data elements for a single command.
Space	A command, its numerical entry value, and suffix mnemonic.

Terminator Character

The only allowed terminator character for 37XXX GPIB messages is the linefeed character (0A, decimal 10).

GPIB Error Conditions

The 37XXX responds to GPIB errors in the following manner:

- A beep is issued.
- An error message is displayed on the screen.

- A bit is set in the Standard Event Status Register, and, if enabled, an SRQ is generated.
- An entry is written into the non-volatile Service Log describing the error condition, along with time and date and, often, details helpful in handling the error. When full, error entries at the bottom of the log are removed to make room for new entries.
- If the error is GPIB related, the error message and the offending program message, if applicable, can be output over the GPIB via a query command. The previous error, if any, is also available via another query.

The bits set in the Standard Event Status Register for GPIB errors are as follows:

Bit 5 - Command Error (CME)
Invalid syntax, unrecognized command or command arguments, separaters or terminators that do not conform to correct IEEEE 488.2 formats. *The 37XXX will ignore the remainder of commands in that program message.*

Bit 4 - Execution Error (EXE)
This bit is set if:
(1) A data entry parameter is out of range or not applicable.
(2) Action is impossible.
(3) Action is not possible in the current context or instrument state, or if a required option is not fitted.

Bit 3 - Device Dependent Error (DDE)
This bit is set if a valid requested action failed due to an instrument specific error condition, such as attempting to access a bad floppy disk.

Bit 2 - Query Error (QYE)
This bit is set if the 37XXX cannot provide the requested data. For example, if an output is attempted when no data has been requested or available, or if the output buffer is cleared due to sending more commands when data from a previous request has not yet been output.

Refer to Chapter 12, Error messages, for a listing of all 37XXX error messages (including GPIB errors).

Testing the 37XXX GPIB Operation

The following test can be used to check your GPIB cable and 37XXX GPIB connectors.

1. Disconnect all GPIB cables from the 37XXX.
2. Connect your GPIB cable between the two GPIB connectors on the 37XXX rear panel.
3. Invoke the test from the front panel as follows: Option Menu key, DIAGNOSTICS, PERIPHERAL TESTS, GPIB TEST. The test will run for a few seconds, then report the result on the front panel display.

1-6 IEEE 488.2 DOCUMENTATION SUMMARY

Table 1-2 provides answers to the "Device Documentation Requirements" listed in the IEEE Standard 488.2-1992. It is also a good summary of the GPIB operational characteristics of the 37XXX.

Table 1-2. 37XXX IEEE 488.2 Standard Documentation Summary (1 of 3)

Number	Requirement Item	Implementation in VNA
1	Interface Function Subsets Implemented	SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0, E2.
2	Device behavior when the user (unit) GPIB address is set outside of the 0–30 range	VNA returns an Out-of-Range error, issues an audible beep, and the entry color on front panel menu display is changed to red. Entered address is not accepted.
3	When is a user address change recognized?	New address is accepted and entry color remains green.
4	Description of settings at power-on	The front panel setup that was in effect prior to power down will be restored, *except:* the 37XXX will be taken out of hold if it was previously set. Periodic IF Cal will be returned to timed operation. **Memories saved:** 1. GPIB address 2. Internal hardware calibration data 3. Information reported via the *IDN? and *OPT? queries. 4. Calibration coefficients 5. Normalized trace data 6. Stored front panel setups **Memories Cleared:** 1. Service Request message. 2. Standard event status register (except the Power-On bit is set) 3. Extended event status register 4. Limit pass/fail status register 5. Enable registers for items 2 thru 4, above. 6. GPIB input and output queues. 7. Trigger action for *TRG and GET reset to null. **Data Transfer:** 1. Data transfer is reset to MSB first for numerical array data transfers. 2. Data transfer format is reset to default, ASCII mode (FMA) for numerical array transfers. 3. Data pair format for OFD/IFD/OM1-OM6 commands is set to default (off) mode. (See command DPR0.) **Menu Displayed:** Setup Menu

Table 1-2. 37XXX IEEE 488.2 Standard Documentation Summary (2 of 3)

Number	Requirement Item	Implementation in VNA
5	Message exchange options	
	a. Size and behavior of input buffer	a. Default size = 3 KByte. Size increases to required amount, as needed, for <Arbitrary Block> transfers. For the <Indefinite Length Arbitrary Block> data elements, the input buffer size for that element is 64 Kbyte. Attempting to program more data than 64 KByte will cause a loss of all data for that element. A DDE error message will be issued to indicate this condition. For <Definite Length Arbitrary Block> data elements, an attempt is made to set the buffer size for that element to the size indicated in the header. If there is insufficient system memory available at the time, all data for that element is lost. A DDE error message will be issued to indicate this condition.
	b. Queries that return more than one <RESPONSE MESSAGE UNIT>	b. None
	c. Queries that generate a response when parsed	c. All
	d. Queries that generate a response when read	d. None
	e. Commands that are coupled	e. None
6	Functional elements used in construction of device-specific commands.	See command descriptions.
7	Buffer size limitations	37XXX Attempts to allocate amount required; sets DDE error if not possible. (See 5a., above)
8	<PROGRAM DATA> elements that may appear within an <expression>	N/A (expressions are not used)
9	Response syntax for queries	See command descriptions.
10	Description of device-to-device message transfer traffic that does not follow the rules for <RESPONSE MESSAGES>	None
11	Size of block data responses	Variable, See command descriptions for details.
12	IEEE.488.2 Common commands and queries that are implemented	*CLS, *DDT, *DDT?, *ESE, *ESE?, *ESR?, *IDN?, *IST?, *OPC, *OPC?, *OPT?, *PRE, *PRE?, *RST, *SRE, *SRE?, *STB?, *TRG, *TST?, *WAI
13	State of VNA following the successful completion of the Calibration query	Normal State
14	Maximum length of the block used to define the trigger macro (1.) The method of interpreting *TRG within a *DDT command sequence (2.)	1. 255 characters. 2. On execution, the 37XXX returns a command error and ignores the rest of the string.

Table 1-2. 37XXX IEEE 488.2 Standard Documentation Summary (3 of 3)

Number	Requirement Item	Implementation in VNA
15	Maximum length and complexity of macro labels; maximum length of block used to define a macro; and how recursion is handled during macro expansion, if macro commands are implemented.	N/A
16	Response to common query *IDN?.	ANRITSU, <Model>, <SN>, <SW revision>
17	Size of the protected user data storage area, if the *PUD command or *PUD? query are implemented.	N/A
18	Size of resource description, if the *RDT command or *RDT? query are implemented.	N/A
19	States affected by *RST, *LRN?, *RCL, and *SAV.	*RST = default state (see Chapter 11), *LRN, *RCL, *SAV not implemented
20	Scope of the self test performed by *TST? command.	Fully automated internal hardware testing/reporting. Failure results, if any, are written to the internal non-volatile service log for user access.
21	Additional status data structures used in status reporting.	Limits Event Status and Extended Event Status registers; refer to Chapter 7 for details.
22	Statement describing whether each command is overlapped or sequential.	All commands are sequential.
23	Functional criteria that is met when an operation complete message is generated in response to that command.	N/A – No overlapped commands.
24	Descriptions used for infinity and not-a-number.	N/A

Chapter 2 GPIB Programming Basics

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Chapter 2
GPIB Programming Basics

2-1 INTRODUCTION

This chapter contains a brief introduction to GPIB programming techniques and describes procedures to be used when preparing GPIB programs for the 37XXX VNA. It includes information about equipment requirements and configuration for GPIB control of the 37XXX VNA, and many programming tips.

Familiarity with manual (front panel) operation of the 37XXX is assumed. (Throughout this section, the 37XXX VNA is referred to simply as "37XXX".) A complete description of front panel operation is contained in the appropriate 371XXA, 372XXB, or 37XXX Vector Network Analyzer System Operation Manual.

2-2 EQUIPMENT AND CONFIGURATION

The programming examples contained in this chapter assume the equipment listed below is present and configured as described.

Required Equipment

The following equipment represents a minimum GPIB controllable 37XXX VNA system:

- A 37XXX Vector Network Analyzer.
- A computer/controller that supports the IEEE 488 GPIB standard. The examples in this chapter address the IBM compatible computers.
- An IEEE-488 GPIB interface (built in, or add-in peripheral card) with appropriate driver software. The National Instruments GPIB IEEE-488.2 interface is assumed for all examples in this chapter.
- Appropriate software (any of the following):
  - Microsoft QuickBASIC, version 4.0 (or later)
  - Microsoft "C", version 5.1 or later, or Quick C, version 2.5.
  - Any other programming language, or application software, that supports the IEEE 488 GPIB interface (Pascal, Fortran, etc.).
- A GPIB cable (preferably 2 meters long).

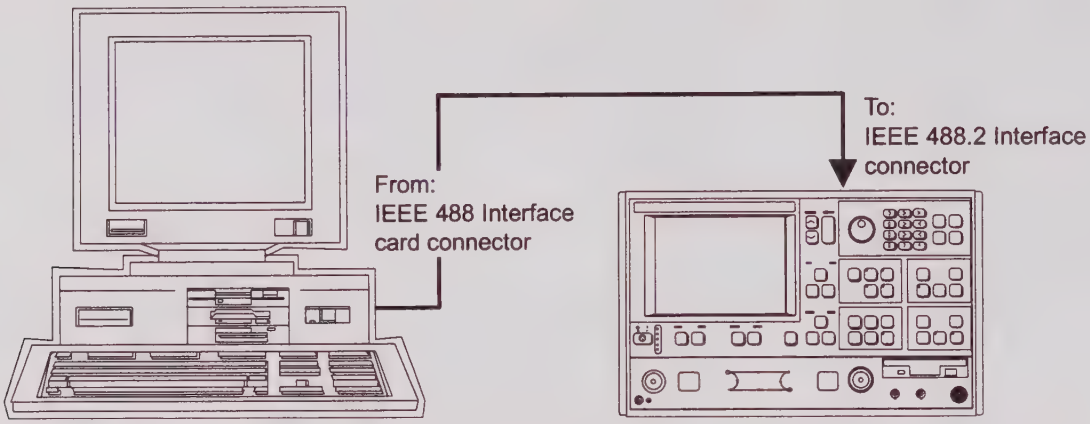
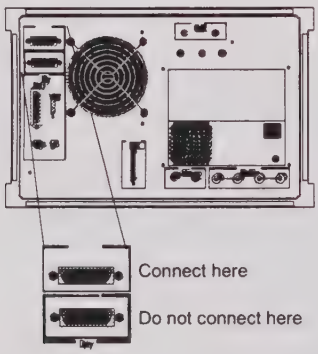


Figure 2-1. *Model 37XXX Shown Connected to an IEEE 488.2 Controller*

NOTE

The IBM PC and National Instruments GPIB interface were chosen for demonstrating the 37XXX GPIB operation in this manual. Any other GPIB controller that conforms to the IEEE 488 standard can be used to interface to the 37XXX.

Configuration



Configure the 37XXX as shown in Figure 2-1. Apply power to the 37XXX and allow the system software to load from disk. Once the software has finished loading and start-up testing is complete, the 37XXX is ready to be remotely controlled via the GPIB. It is important to note that *the 37XXX will not respond to GPIB commands until the 37XXX system software has been loaded.*

Connect a GPIB cable from the computer/controller to the rear panel IEEE 488.2 GPIB connector (left).

Apply power to the computer/controller and load the appropriate programming language software (QuickBASIC, "C", etc.).

The default GPIB address for the 37XXX (6) is assumed for all examples in this chapter.

2-3 GPIB PROGRAM ELEMENTS

The discussions in this chapter demonstrate basic GPIB programming concepts that are typical elements of most GPIB application programs.

The controller used to demonstrate these concepts is the National Instruments 488.2 GPIB Interface which will be referred to as NI488 throughout this chapter.

NOTE

Regardless of the controller used, consult its documentation and software distribution disks for complete details and examples on setup and use of the controller's hardware and interface software functions.

National Instruments GPIB Interface

Throughout this chapter references will be made to variables, constants, and controller function calls declared in the NI488 file that your application uses to interface to the GPIB controller. This file is `decl.h` for C and `qbdecl.bas` for QuickBASIC, and it must be included in your GPIB program. Consult your documentation for the files used for other environments.

Including and compiling the appropriate NI488 file when preparing your application is what allows use of the NI488 GPIB interface procedures and function calls in your program. Also, the file named `gpib.com` must be installed in memory upon bootup of your computer. Typically, access to this file is through your system configuration file (that is, config.sys for DOS based computers).

The `gpib.com` is what allows your GPIB program to physically interface to the installed GPIB controller and to execute GPIB function calls during operation.

NOTE

Consult your controller's documentation for complete details on software and hardware setup, test, and use prior to proceeding with the following discussion. Knowledge of your controller and its operation will be assumed from this point forward.

Definitions

The following definitions apply for the remainder of this chapter:

- board = 0, Active controller board number
- address = 6, GPIB address of the instrument.
- Address List = addresList, list of GPIB addresses terminated with the NI488 constant NOADDR. For our examples the list consists of two elements (6, NOADDR).

2-4 INITIALIZING THE GPIB

Initializing is the process of directing your controller to take control of the bus (become CIC — Controller In Charge) and setting the GPIB software to initial default settings.

NOTE

Default initial installation configuration is assumed for the NI488 hardware and software.

NI488 does this by sending an interface clear to the desired board using:

```
SendIFC(board)
```

The board will become CACS (Active controller). NI488 software allows use of up to 4 controllers. The board specified by the `SendIFC()` function must be designated CIC – Controller In Charge in its setup and configuration. See NI488 config utility in NI488 documentation.

`SendIFC()` is also useful anytime you want to insure that your GPIB controller has control over the bus, the GPIB software is in its default parameters, and GPIB of all instruments on the bus is cleared and in idle state.

The following NI488 functions are also useful when initializing your application.

- To place all instruments in remote state, use:

  ```
  EnableRemote(board, addressList)
  ```

- To clear GPIB operation of all instruments use:

  ```
  DevClearList(board, addressList)
  ```

2-5 SHUTTING DOWN THE GPIB SYSTEM

An important step in quitting a GPIB application is to shut down the GPIB interface. For the NI488 this is done by

- Insuring that you have control over the bus.
- Clearing all instruments' GPIB and placing them in an idle state.
- Releasing the controller GPIB software and hardware.

Implement the above by sending:

```
SendIFC(board)
ibonl(board, 0)
```

2-6 DETECTING GPIB ERRORS

It is important to use error checking code throughout your application program. Error checking usually does not significantly impact the speed of a GPIB application. This is because the GPIB bus operations are I/O operations whose execution time depends on a handshake process. This process is typically much slower than executing (error checking) code in your computer's memory.

Full Error Detection

Full error detection and handling is an invaluable debugging tool that should be used to its fullest during development of your application.

Limited Handling Error Detection

Error detection with at least a limited amount of handling should be used after each GPIB I/O operation in your final program. This will insure predictable operation of your application, proper system control, and accurate data processing.

NI488 Global Variables

The NI488 interface maintains three global variables useful in determining correct GPIB operations. These variables are updated after, and reflect the condition of, the last GPIB call to the interface. The variables are:

- `IBSTA`
  This variable provides the latest bus activity status; that is, errors, completions, time outs, etc.
- `IBERR`
  This variable provides information on the type of error, if an error was reported in `IBSTA`.
- `IBCNT/IBCNTL`
  The number of data bytes transferred on the bus in the last operation. `IBCNTL` is the "long integer" version of `IBCNT`.

Example

Error checking for the NI488 interface is as follows. After each GPIB call, the `IBSTA` is checked for errors using the NI488 declared constant `EERR` - in BASIC, or `ERR` in C. If true, the `gpiberr()` function is called to decode and display the global variables `IBSTA`, `IBERR`, and `IBCNT`. For example, for QuickBASIC, the following code is inserted after a GPIB call:

```
IF IBSTA% AND EERR THEN
  CALL gpiberr (error during GPIB operation)
END IF
```

NOTE

The NI488 disks and documentation contain the source listing of the `gpiberr()` function. This function should be copied into your code and used after each GPIB function call. Use the example programs provided on the NI488 distribution disks. Note that `gpiberr()` can also be modified to fit a particular application's requirements.

2-7 SETTING GPIB OPERATION TIME OUT

Setting GPIB time out is necessary to allow for lengthy instrument operations to complete before the application program continues with its processing. (Refer to paragraph 2-1, Waiting for Instrument Operations to Complete.)

Example The NI488 time out is set using the `ibtmo()` interface call, as follows:

```
ibtmo(instrument_handle, timeout_setting)
```

Where:

- `instrument_handle` = The value returned by the `ibfind()` or `ibdev()` interface call for the instrument.
- `timeout_setting` = A value that disables or sets the time out setting. NI488 uses declared constants to represent the allowable time out settings, for example, the T100s constant is 100 seconds, T30ms is 30 milliseconds, TNone is 0, etc. The complete list is in the NI488 include file for your language (**`qbdecl.bas`**, **`decl.h`**).

NOTE

Consult NI488 documentation and distribution disks for information and an example on using `ibtmo()`, `ifbind()`, and `ibdev()`.

2-8 SENDING COMMANDS

GPIB controllers provide for sending GPIB commands to an instrument (or the controller itself if its address is used). The NI488 uses several commands, the most common is:

```
Send (board, address, buffer, numBytes, eot_mode)
```

Where:

- `board, address` = see section 2-3 for definitions.
- `buffer` = String of one or more instrument specific GPIB commands from the defined list in the instrument's GPIB documentation.
- `buffer` = String of one or more instrument specific GPIB commands from the defined list in the instrument's GPIB documentation.
- `numBytes` = The number of bytes contained in the buffer.
- `eot_mode` = The method used to signal end of transmission. This is typically done using ASCII linefeed character `0A hex` (10 decimal) and then setting EOI state (end of transmission) on the bus. The NI488 defines the following constants for use to setup end of transmission methods:
  - `NLend` Linefeed with EOI
  - `DABend` EOI only
  - `NULLend` Do nothing to mark end of transmission

Example: Send the 37XXX at address 6, the commands "`CH2;DSP;MAG`", from controller number 0, using the linefeed with EOI to mark the end of transmission:

```
Send (0, 6, "CH2;DSP;MAG",11,NLend)
```

37XXX Commands Used The above example uses the following commands defined in the 37XXX command set:

`CH2` `sets active channel to 2,`

`DSP` `displays only the active channel on the whole screen,`

`MAG` `displays the active channel's data in log magnitude format (dB).`

NOTE

The semicolon (;) is used to separate the different commands.

2-9 RECEIVING DATA FROM AN INSTRUMENT

In order to receive data from an instrument over the GPIB, you must first instruct the instrument to output the desired data. You do this by using one of the instrument's defined data output commands and the controller Send() function (see paragraph 2-8, "Sending commands").

The instrument must then be given permission to start sending data (talk). The NI488 call to do this is:

```
Receive(board, address, buffer, numBytes,
        eod_mode)
```

Where:

- `board, address` = see section 2-3 for definitions.
- `buffer` = The name of the memory address of the buffer where the received data is to be placed. Typically this is an array of type characters (a string). Although, for binary data transfers, the NI488 software will accept an array of almost any type; that is. integer, floating point, etc.
- `numBytes` = The maximum number of bytes to read from the instrument. Insure that "buffer" above is of at least this size.
- `eod_mode` = The method used to signal the controller to stop receiving data. Typically the NI488 constant `STOPend` is used (EOI state – end of transmission – set with the last byte). If you want to stop receiving when a certain transmission terminator character is received, then use the hex value of that character instead of the `STOPend`.

Example: Use the NI488 controller number 0, to send the 37XXX at address 6, the command "ONP" using the line feed with EOI to mark end of transmission:

```
Send(0, 6, "ONP", 3, NLend)
```

Upon receiving a data output command, the 37XXX will prepare the data requested and wait for the controller to put it in the talk state so it can put the data out on the bus. This is done by:

```
numBytes = 20
Receive(0, 6, buffer, numBytes, STOPend)
```

Error Handling: The number of bytes actually sent on the bus can now be retrieved from the NI488 interface software by immediately storing the value of the `IBCNT` global variable in a program variable as follows:

```
actualReceivedBytes = IBCNT
```

If we expected an exact number of bytes to be received, we can compare the requested number of bytes "numBytes" with the actual received "actualReceievedBytes" and take some corrective action if they do not match. You should do this before continuing to the data processing section of the program:

```
If numBytes ISNOTEQUALTO actualReceivedBytes then
   Call gpiberr("incorrect number of bytes
   received")
END IF
```

NOTE

Consult your programming language syntax for the operator used to check in-equality, to use in place of ISNOTEQUALTO.

37XXX Commands Used

The above example uses the following commands defined in the 37XXX command set:

- `ONP` – Outputs the number of data points in the current sweep. It will output the number represented in ASCII format.

2-10 SRQ HANDLING

Controllers use a dedicated line on the GPIB to detect if an instrument has requested service. An instrument sets this line when a predetermined set of conditions inside it have been met. These conditions are selected and programmed into the instrument by setting the Service Request Enable Register to a decimal value that corresponds to the bit values which, when true, will generate an SRQ. This is a binary weighted decimal value in the range 0 – 255.

Calculating the Binary Weighted Bit Value

The decimal value of a bit in a register is equal to the number 2 raised to a power equal to the bit number. For example, the decimal value of bit 4 in the Service Request Enable Register is 2 raised to the power 4 which is: $2^4 = 16$. Similarly, the decimal value of bit 0 is: $2^0 = 1$.

Enabling Service Request

To enable service request in the 37XXX, use the command `*SRE` - Service Request Enable, with the desired value.

Example

Command the 37XXX to request service; that is, generate an SRQ, when it has data to send, then output the number of points in the current sweep. We need to enable bit 4 (MAV), Message Available, in the Service Request Enable Register, so a service request will be generated when the data is ready. The decimal value of bit 4 is 16 ($2^4 = 16$).

The NI488 Send() function is used to send the 37XXX at address 6, the commands "`*SRE 16;ONP`" (12 ASCII bytes), from controller number 0, using the linefeed with EOI to mark end of transmission:

```
Send(0, 6, "*SRE 16;ONP", 12, NLend)
```

Commands Used

The above example uses the following commands defined in the 37XXX command set:

***SRE** – Sends a Status Request Enable mask.

ONP – Outputs the number of sweep points.

NI488 RQ Functions

The following NI488 functions are useful in handling SRQ operations. Consult your NI488 documentation for full details.

- To test for occurrence of SRQ:

```
TestSRQ(board, SRQset)
```

Where:

- SRQset contains 1 if SRQ is set, or 0 if it is not.

- To wait for occurrence of SRQ and report if it was set:

```
WaitSRQ(board, SRQset)
```

Where:

- SRQset contains 1 if SRQ was set within the time out allowed, or 0 if it was not. (See paragraph 2-8, Setting GPIB Operation Time Out.)

- To find out which instrument is requesting service (`set SRQ`), instruct the controller to perform a serial poll and return the results as follows:

```
FindRQS(board, addressList, statusByte)
```

Where:

- `statusByte` = The status byte of the first requester found is returned in this variable.
- The index in `addressList` that contains the address of the instrument requesting service is returned in the `IBCNT` global variable.

- To read out the SRQ byte from an instrument:

```
ReadStatusByte(board, address, statusByte)
```

- To parallel poll, see the following functions in the NI488 documentation.

```
PPoll()
PPollConfig()
PPollUnconfig()
```

2-11 WAITING FOR INSTRUMENT OPERATIONS TO COMPLETE

Instruments often require a period of time to complete certain operations such as disk I/O, measurement sweep, data preparation, etc.. Your application program must allow the instrument time to complete these operations and be able to detect when operations are completed.

The simplest mechanism for synchronizing operations over the GPIB involve using the `*OPC?` Operation Complete query and the `*OPC` - Operation Complete command.

Example 1 Command the 37XXX to perform a sweep and hold then place an ASCII "1" in its output buffer (`*OPC?`) when done.

The NI488 `Send()` function is used to send the 37XXX at address 6, the commands, `"TRS;WFS;HLD;*OPC?"`, from controller number 0, using the linefeed with EOI to mark end of transmission. The `Receive()` function is then used to hold the program from continuing processing until it receives the output of the `*OPC` command (or times out):

```
buffer = "TRS;WFS;HLD;*OPC?"
Send(0, 6, buffer, 17, NLend)
oneByte = 1
Receive(0, 6, buffer, oneByte, STOPend)
```

NOTE

The time out must be set high enough to allow the sweep to complete (see "Setting time outs" in paragraph 2-8).

Example 2 Now we will modify the above example to request service when bit 4 (MAV) in the Status Byte Register is set (`*SRE 16`) to let the program know when the `*OPC?` data is ready to be output. This overcomes the time out problem but it does increase program complexity.

```
buffer = "*SRE 16;TRS;WFS;HLD;*OPC?"
Send(0, 6, buffer, 25, NLend)
SRQset = 0
WHILE (SRQset = 0)
    WaitSRQ(board, SRQset)
ReadStatusByte(board, address, statusByte)
oneByte = 1
Receive(0, 6, buffer, oneByte, STOPend)
```

NOTE

`TestSRQ()` can be used instead of `WaitSRQ()` to check for the occurrence of SRQ in the WHILE loop. This would

allow your program to perform other tasks while waiting for SRQ inside the WHILE loop.

37XXX Commands Used

Examples 1 and 2 above used the following commands defined in the 37XXX command set:

```
*SRE - sends a Status Request Enable value.
TRS - triggers a sweep
WFS - waits one full sweep
HLD - goes into hold mode
*OPC? - outputs an ASCII "1" when operation is
        complete
```

NOTE

Refer to Chapter 7, Remote Only Operations for more information and examples on status reporting and service request generation.

Chapter 3
Series 37XXX
Programming Examples

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Chapter 3
Series 37XXX
Programming Examples

3-1 INTRODUCTION

This chapter contains example programs to familiarize the user with 37XXX programming. Familiarity with manual (front panel) operation of the 37XXX is assumed. (Throughout this section, the 37XXX VNA is referred to simply as "37XXX".) A complete description of front panel operation is contained in the appropriate 37XXA, 372XXB, or 373XXA Vector Network Analyzer System Operation Manual.

Also, it is assumed that you have read Chapters 1 and 2 and are familiar with the information they contain. This information describes the various syntax and functions used in the example sequences presented throughout the chapter. This includes: Send, Receive, IBCNT, IBERR, ISNOTEQUALTO, and others.

3-2 37XXX PROGRAMMING EXAMPLES

The main sequences for five example 37XXX programs are listed and explained in the following pages. In these examples, the NI488 function calls are abbreviated; refer to Chapter 2 and the NI488 documentation for full details. Refer to the 37XXX Command Function groups and the Command listings in this manual for complete details on 37XXX command operations.

NOTE

The functions and procedures called from the example sequences in paragraphs 3-3 through 3-7 are provided at the end of this chapter in paragraphs 3-8 through 3-10.

The intent of these example program sequences is to provide algorithms useful when programming various features of the 37XXX. You are encouraged to study these algorithms, copy them into your programming environment, and tailor them for your language and application.

3-3 EXAMPLE 1: BASIC OPERATIONS

This example sequence lists and explains some common 37XXX operations.

- Setup display and sweep frequencies

```
Send (0,6,"CH2;DSP;MPH;SRT 40 MHZ;STP 20 GHZ",NLend)
```

- Setup markers

```
Send (0,6,"MK1 40 MHZ;MK2 20 GHZ",NLend)
```

- Read and store current instrument setup
  - Request instrument setup string

```
Send (0,6,"OFP",NLend)
```

  - Read instrument setup string

```
Receive(instrSetup, MAXSIZE, STOPend)
```

  - Get number of bytes transferred3

```
sizeInstrSetup = IBCNT
```

> ***NOTE***
> Program variables *instrSetup* and *sizeInstrSetup* will be used later with the **IFP** command to input the saved setup string.

- Read sweep frequencies
  - Trigger and wait for full sweep then hold

```
Send (0,6,"TRS;WFS;HLD",NLend)
```

  - Wait for operations to complete (See "Wait for Instr()" example, page 3-12.)

```
WaitForInstr()
```

  - Request sweep frequencies (**OFV**):
    Use floating point (64 bit) binary format (**FMB**), Least Significant Byte first ordering (**LSB** for IBM/compatible PCs only).

```
Send (0,6,"LSB;FMB;OFV",NLend)
```

  - Get number of bytes to read:
    See Chapter 7, "Data Transfer" section for details on <Arbitrary Block> data transfers and structure of the header used to precede and give number of bytes in data block. (See "GetNumBytes( )" example, page 3-13.)

```
numBytes = GetNumBytes(address, headerString)
```

  - Read frequencies
    `freqArray` is a floating point double precision array of up to 1601 elements.

```
Receive(freqArray, numBytes, STOPend)
```

- Check for complete transfer

```
if (numBytes ISNOTEQUALTO IBCNT then
  gpiberr("Could not read freq list correctly")
```

- Reset instrument
  - Send reset command

```
Send (0,6,"*RST",NLend)
```

  - Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

- Download and restore a previously saved setup
  - Command instrument to receive a setup string. Use "NULLend" (see Chapter 2, paragraph 2-9.)

```
Send (0,6,"IFP ",NLend)
```

NOTE

The space after the **IFP** command is needed to separate it from the setup string, which follows.

  - Send the setup string. Use "NLend" (see Chapter 2, paragraph 2-9.)

```
Send (0,6,(instrSetup, sizeInstrSetup),NLend)
```

  - Check if all data was sent correctly

```
if (sizeInstrSetup ISNOTEQUALTO IBCNT then
 gpiberr("Error sending setup string")
```

- Select instrument Marker 1 active

```
Send (0,6,"MR1",NLend)
```

- Read measurement trace
  - Trigger and wait for full sweep then hold

```
Send (0,6,"TRS;WFS;HLD",NLend)
```

  - Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

  - Request trace data:
    in final trace graph type values (**OFD**), in floating point (32 bit) binary format (**FMC**). Use Least significant Byte first ordering (**LSB**, for IBM/compatible PCs only)

```
Send (0,6,"LSB;FMC;OFD",NLend)
```

- ❑ Get number of bytes to read (page 3-13)

```
numBytes = GetNumBytes
```

- ❑ Read out the trace data values.

```
Receive(traceData, numBytes, STOPend)
```

- ❑ Check if all data was transferred

```
if (numBytes ISNOTEQUALTO IBCNT then
  gpiberr("Could not receive data.")
```

- ❑ Calculate number of sweep points in data string POINTSIZE is 8 bytes for data transfers using the **FMB** format and 4 bytes if using the **FMC** format. See Chapter 7, "Data Transfer Commands."

```
numFreqs = numBytes / POINTSIZE
```

- Put instrument(s) in local to allow use of front panel

```
EnableLocal(board, addressList)
```

3-4 EXAMPLE 2: 12 TERM CALIBRATION

This example sequence lists and explains 37XXX commands used for automated 12 Term Calibration.

- Display instructions to operator on computer screen

```
PRINT "Install 33KFKF Phase Equal Insertable on
       Port 1"
PRINT "Install 3670K502 Thru Line female side to
       Port 2"
PRINT "so the new Port 2 is the male end of the
       thru"
PRINT "Shape the end of the thru so it is near
       Port 1"
PRINT "(Press a key when ready)"
```

- Set up calibration parameters

```
Send (0,6,"SCM;LTC;C12;ISN",NLend)
```

- Set up calibration frequencies

```
Send (0,6,"DFC;FRS 1 GHZ;FRI 100 MHZ;FRP 41;FIL;DFD",NLend)
```

- Set up connectors and loads

```
Send (0,6,"P1C;CFK;P2C;CMK;BBL",NLend)
```

- Begin calibration data collection

```
Send (0,6,"BEG",NLend)
```

- Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

- Instruct operator via the controller screen...
  To connect ISOLATION DEVICES between Ports 1 and 2 and wait for him; then measure devices. (See TakeCalData(), pg 3-14).

```
PRINT "Connect ISOLATION DEVICES between
       Ports 1 and 2"
PRINT "Press ENTER when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect BROADBAND LOADS between Ports 1 and 2 and wait for him; then measure devices.

```
PRINT "Connect BROADBAND LOADS between
       Ports 1 and 2."
PRINT "Press a key when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect OPEN to Port 1 and SHORT to Port 2 and wait for him; then measure devices.

```
PRINT "Connect OPEN to Port 1 and SHORT
       to Port 2"
PRINT "Press a key when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect SHORT to Port 1 and OPEN to Port 2 and wait for him; then measure devices.

```
PRINT "Connect SHORT to Port 1 and OPEN
       to Port 2
PRINT "Press a key when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect Port 1 and Port 2 with the reminder to NOT INSTALL ADDITIONAL THRU LINES/ADAPTERS BETWEEN PORTS, and wait for him; then measure devices.

```
PRINT "Connect Port 1 and Port 2 but
       DO NOT INSTALL ADDITIONAL THRU
       LINES/ADAPTERS BETWEEN PORTS
PRINT "Press a key when ready"
TakeCalData()
```

3-5 EXAMPLE 3: CALIBRATION DATA TRANSFER

This example sequence lists and explains 37XXX commands for transferring calibration error terms/coefficients.

- Setup a Frequency Response Transmission Calibration.
  - Set up calibration parameters

```
Send (0,6,"SCM;LTC;CFT",NLend)
```

  - Set up calibration frequencies

```
Send (0,6,"DFC;FRS 1 GHZ;FRI 100 MHZ;FRP 41;FIL;DFD",NLend)
```

  - Begin calibration data collection

```
Send (0,6,"BEG",NLend)
```

- Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

- Instruct operator via the controller screen...
  To connect THRU LINE between Ports 1 and 2 and wait for him.

```
PRINT "Connect THRU LINE between
       Ports 1 and 2"
PRINT "Press ENTER when ready"
```

  - Measure thruline (page 3-12).

```
TakeCalData()
```

  - Read Calibration Coefficient Data from instrument and store the 488.2 data transfer header which is useful for sending the same size data array back to the 37XXX later. Also calculate and store the number of frequency points read in.
  - Request the error term/coefficient array (**OC1**) in 64 bit Floating Point format (**FMB**), Least Significant Byte order (**LSB**, for PCs only). See Chapter 7, "Data Transfer Commands" for the error terms returned by the OCx series commands.

```
Send (0,6,"LSB;FMB;OC1",NLend)
```

  - Get number of bytes contained in the data string and store the header read from the 37XXX into calHeader (string of characters). See GetNumBytes(), page 3-13.

```
numBytes = GetNumBytes(address, calHeader)
```

  - Read calibration data values
    calData is an 82 element double precision floating point array.

```
Receive(calData, numBytes, STOPend)
```

- Check if all data was transferred

```
if (numBytes ISNOTEQUALTO IBCNT) then
   gpiberr("Could not receive data.")
```

- Store number of calibration data bytes transferred

```
calDataSize = IBCNT
```

- Calculate number of frequency points in the data trace if desired. POINTSIZE is 8 bytes for data transfer using the **FMB** format. See Chapter 7, "Data Transfer Commands." The division by two is because each data point represents a complex data pair (real, imaginary).

```
numFreqs = (CalDataSize / 2) / POINTSIZE
```

- Send Calibration Coefficient Data to instrument
  - Simulate a Transmission Calibration
    Command the 37XXX to apply transmission calibration coefficients to data (**AFT**), then input the calibration coefficient array for transmission error term (**IC1**), in 64 bit Floating Point format (**FMB**), Least Significant Byte order (**LSB**, for use with PCs only). Use "NULLend" (see Chapter 2, paragraph 2-9.)

```
Send (0,6,"AFT;LSB;FMB;IC1",NLend)
```

NOTE

Note the space after the **IC1** command; it is needed to separate it from the calibration coefficient data array, which follows.

  - Send cal coefficient #1 data transfer header (same one that was received from the **OC1** transfer). Use "NULLend" (see Chapter 2, paragraph 2-9.)

```
calHeaderSize = LENGTHOFSTRING(calHeader)
Send (0,6, (calHeader, calHeaderSize, NULLend),NLend)
```

NOTE

Consult your compiler documentation for a function that returns length of a string.

  - Check for proper transfer

```
if (CalHeaderSize ISNOTEQUALTO IBCNT) then
  gpiberr("Data not sent properly")
```

  - Send cal coefficient #1 data. Use "NLend" (see Chapter 2, paragraph 2-9.)

```
Send (0,6,(calData, calDataSize),NLend)
```

- Check for proper transfer

```
if (calDataSize ISNOTEQUALTO IBCNT1 then
   gpiberr("Data not sent properly")
```

- Wait for operation to complete (page 3-12)

```
WaitForInstr()
```

- Turn on/apply error correction

```
Send "CON"
```

3-6 EXAMPLE 4:ASCII STRING TRANSFER

This is an example sequence showing data string input to the 37XXX. The string sent below is used to set hardcopy data output labels.

The 37XXX requires the double quote characters (" ") to delimit ASCII strings being sent to it. That is, to send a string called *mystring* you would actually send *"mystring"*. This presents a problem since programming languages also delimit a character string with double quotes. In order to send the 37XXX a quote (") as a regular character, you must precede it with the backslash (\) character in the C language and with a quote character (") in BASIC.

NOTE

A 37XXX ASCII string may also be delimited using a single quote character (') at the beginning and end of the string. In which case, the backslash (\) for C and the double quote (") in BASIC are not required.

- Define DUT Model in the data label.
  The following command sequence needs to be sent to the 37XXX:

```
LMS "4_8_FILTER"
```

  - If using C use this syntax

```
Send (0,6,"LMS \"4_8_FILTER\"",NLend)
```

  - If using BASIC use this syntax

```
Send (0,6,"LMS ""4_8_FILTER""",NLend)
```

  - Here the same command sequence can be sent with the single quotes (' ') without the need for additional character as above.

```
Send (0,6,"LMS '4_8_FILTER'",NLend)
```

- If shutting down the GPIB immediately after this series of commands, then you must also make the controller wait for the 37XXX to completely receive this data before shut down.

```
WaitForInstr()
```

3-7 EXAMPLE 5: DISK OPERATIONS

This example sequence lists and explains 37XXX commands for 37XXX internal disk operations.

- Sweep, and store channel 1 trace data to memory

```
Send (0,6,"CH1;S11;CH3;S21;WFS;CH1;STD",NLend)
```

- Store trace memory data to hard disk
  The following command sequence needs to be sent to the 37XXX:

```
Send (0,6,"SAVE 'C:\CH1_S21.NRM'",NLend)
```

- Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

- Output channels 1 Tabular Data to instrument floppy disk

```
Send (0,6,"SAVE 'A:\CH1_S21.DAT'",NLend)
```

- Wait for operations to complete

```
WaitForInstr()
```

- Save Front Panel and Calibration setup to hard disk

```
Send (0,6,"SAVE 'C:\SETUP1.CAL'",NLend)
```

- Wait for operations to complete

```
WaitForInstr()
```

- Reset system to default state

```
Send (0,6,"*RST",NLend)
```

- Recal Front Panel and Calibration setup from hard disk

```
Send (0,6,"RECALL 'C:\SETUP1.CAL'",NLend)
```

- Wait for operations to complete

```
WaitForInstr()
```

- Recall channel trace/noramlization data from hard disk to CH3

```
Send (0,6,"CH3; RECALL 'C:\CH1_S21.NRM'; WFS",NLend)
```

- Wait for operations to complete

```
WaitForInstr()
```

- Delete channel 1 trace/normalization data file from hard disk

```
Send (0,6,"DEL 'C:\CH1_S21.NRM'",NLend)
```

- Wait for operations to complete

```
WaitForInstr()
```

3-8 EXAMPLE PROCEDURE, WaitForInstr()

This example sequence provides coding for the Wait for Instr () procedure used earlier in this chapter's example sequences.

NOTE

Do not use this procedure if the instrument was commanded to output data that has yet to be read by the program since the *OPC? query will, in itself, output data (the character "1")when done with previous operation.

- Set GPIB time out limit to insure enough time is allowed for instrument operations to complete. See `ibtmo()` in the NI488 documentation for details.

```
ibtmo(instrument_handle, T1000s)
```

- Send the Operation Complete query

```
Send (0,6,"*OPC?",NLend)
```

- Wait for instrument to output the ASCII character "1"

```
numBytes=1
Receive(buffer, numBytes, STOPend)
```

- Restore default time out limit

```
ibtmo(instrument_handle, T10s)
```

3-9 EXAMPLE FUNCTION, GetNumBytes(address, headerstring)

This example sequence provides coding for the `GetNumBytes()` function used earlier in this chapter's example sequences.

GetNumBytes() reads the 37XXX output buffer and returns the number of data bytes to be transfered in the ensuing <Arbitrary Block> data string (see Chapter 7, "Data Transfers"). It does this by reading out and decoding the string data header. It will copy the header read out of the 37XXX into headerString so the calling program can use it in cases where the same data block will be sent back to the 37XXX, i.e. `OC1/IC1`.

NOTE

Consult your programming language documentation for string functions to copy, concatenate, and return value of string.

- Read the first byte in the instrument output buffer. Buffer is a temporary array of characters of size 10.

```
numBytes = 1
Receive(buffer, numBytes, STOPend)
```

- Check to be sure it is the "#" character then copy it to `headerString`

```
if (buffer[0] ISNOTEQUALTO '#') then
  gpiberr("Invalid data string")
else COPY(buffer, headerString)
```

- Read second header byte from the instrument output buffer and append it (concatenate) to `headerString`

```
numBytes = 1
Receive(buffer, numBytes, STOPend)
CONCATENATE(buffer, headerstring)
```

- Save the buffer value as a number...

```
numBytes = VALUEOF(buffer)
```

NOTE

This number is the next set of bytes to read. Those bytes when taken as a number will yield the number of actual data bytes contained in the binary string.

- Read the number of bytes indicated by numBytes and append them (concatenate) to `headerString`

```
Receive(buffer, numBytes, STOPend)
CONCATENATE(buffer, headerString)
```

- Save the buffer value as a number
`numBytes` = VALUEOF(buffer)

NOTE

numBytes is the number of bytes, of actual data requested, waiting in the output buffer of the 37XXX.

- Return number of bytes to calling program

```
Return numBytes
```

NOTE

At this point headerString is exactly the same as the data transfer header output by the 37XXX. Recall that this is useful to the calling program in cases where the same data read out is to be sent back to the instrument.

3-10 EXAMPLE PROCEDURE, TakeCalData()

This example sequence provides coding for the TakeCalData() procedure used earlier in this chapter's example sequences.

The TakeCalData() procedure will wait for the operator to press a key on the computer then measure the cal standard installed.

- Wait for operator to press a key on computer when he is ready

```
WAITUNTIL (key is pressed)
```

NOTE

Consult your compiler documentation for a function that waits for a key to be pressed.

- Take cal data then go on to next calibration step

```
Send (0,6,"TCD;NCS",NLend)
```

- Wait for operation to complete (page 3-12)

```
WaitForInstr()
```

Part 2
GPIB Function Groups

This part consists of six chapters that relate the 37XXX GPIB commands to functional groups. Tables within each group provide command descriptions and relationships to front panel keys and their associated menu functions.

***Chapter 4** – describes the commands and suffix mnemonics that relate to Measurement Functions.*

***Chapter 5** – describes the commands that relate to Calibration Functions.*

***Chapter 6** – describes the commands that relate to Markers and Limits Functions.*

***Chapter 7** – describes the commands that relate to Remote-Only Functions.*

***Chapter 8** – describes the commands that relate to System Functions.*

***Chapter 9** – describes the commands that relate to Special Applications Functions.*

Chapter 4
Measurement Functions

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Chapter 4
Measurement Functions

4-1 INTRODUCTION

This chapter describes the measurement function commands (and suffix mnemonics) that control the channel control, measurement control, display control, and enhancement group functions.

NOTE

See Chapter 10, Special Applications Functions for measurement applications.

4-2 DATA ENTRY SUFFIX CODES

Many 37XXX GPIB commands require a following numeric value (or values) that quantify the 37XXX operational parameters being controlled (i.e., frequency, power, etc). These numeric values are scaled to the following units as appropriate:

DECIBELS	METERS	SECONDS
DEGREES	OHMS	VOLTS
HERTZ		

All numeric data entries can be followed by an optional suffix mnemonic (see example). The suffix mnemonics for the 37XXX are listed in Table 4-1. These mnemonics define a weighting factor that is applied to the associated numeric data value. (They perform the same function as the data entry termination keys on the 37XXX front panel.) Furthermore, suffix mnemonics imply unit type, thus enhancing the readability of application programs.

Example: `"SRT 2 Ghz"`

Table 4-1. *Numeric Data Suffix Mnemonics*

Code	Parameter Type	Weighting Factor
DB, DBL, DBM	Power	1.0
DEG	Phase	1.0
RAD	Phase	$180^{\circ}/\pi$
HZ	Frequency	1.0
KHZ	Frequency	10E+3
MHZ	Frequency	10E+6
GHZ	Frequency	10E+9
REU	Real	1.0
IMU	Imaginary	1.0
S	Time	1.0
MS	Time	10E-3
US, USC	Time	10E-6
NS, NSC	Time	10E-9
PS, PSC	Time	10E-12
FS	Time	10E-15
M, MTR	Distance	1.0
CM, CMT	Distance	10E-2
MM, MMT	Distance	10E-3
OHM	Impedance	1.0
V, VLT	Voltage	1.0
MV	Voltage	10E-3
K, KS	Temperature	Degrees Kelvin
XM3	Unitless	10E-3
XX1	Unitless	1.0
XX3	Unitless	10E+3

4-3 CHANNELS GROUP

The commands listed in Table 4-2 perform two separate sets of functions:

- Select the currently active channel (CH1–CH4). The active channel is that channel to which any subsequent channel-based commands are applied.
- Select single or multi-channel display mode (commands D13, D14, D24, DSP, T13, and T24). Commands T13 and T24 each produce a single display frame containing overlaid traces for the two channels specified.

Table 4-2. Channel Command Group

Front Panel Key/Function	Command	Description
Ch1 key	CH1	Selects channel 1 as active channel.
Ch2 key	CH2	Selects channel 2 as active channel.
Ch3 key	CH3	Selects channel 3 as active channel.
Ch4 key	CH4	Selects channel 4 as active channel.
	CHX?	Active channel query.
Display Key/menus, Display Mode, Display Mode menus	D13	Selects dual channel display, channels 1 & 3.
	D14	Selects quad display, all four channels.
	D24	Selects dual channel display, channels 2 & 4.
	DSP	Selects single channel display, using the currently active channel.
	DSP?	Channel display mode query.
	T13	Selects overlaid dual channel (1 & 3) display (one display frame).
	T24	Selects overlaid dual channel (2 & 4) display (one display frame).

4-4 DISPLAY GROUP

The Display key offers menu selections that provide Display Mode, Trace Memory, Limits, Scale, and Graph Type functions, all of which are described below.

Display Mode Function: This function provides selections for the display mode: Single, Dual 1&3, Dual 2&4, Overlay 1&3, Overlay 2&4, or Four Channel.

Trace Memory Function: This function provides a sequence of menus that provide memory and math functions. Memory functions allow viewing of Data, Memory, Data & Memory, Data times Memory, Store Memory, and Disk Operations. Math functions provide Add, Substract, Multiply, and Divide operations.

Limits Function: This function is closely related to the Marker key functions; therefore, it is described in Chapter 7, along with markers.

Scale Functions: This function provides for resolving measurement values. There are selections for Log or Linear Magnitude, Phase, Smith Chart, Group Delay, Real or Imaginary. The operation of these commands are obvious, except for SCL, REF, and OFF.

SCL Command
This command sets the scaling-per-division characteristics of the graph on the active channel. The associated data value determines the resultant scaling factor. The SCL command can also be used to set the scaling on Smith chart type display as follows:

VALUE	SCALING
–3	Sets a 3 dB compressed scale
0	Sets the normal Smith chart scale
10	Sets a 10 dB expanded scale
20	Sets a 20 dB expanded scale
30	Sets a 30 dB expanded scale

REF Command
This command selects the graticule line of the active channel data display on which to place the "REFERENCE LINE." The Reference Line is the graticule line to which the caret points on the 37XXX display, or graph. (Lines 0, 4, and 8 are the bottom, middle, and top of the graph respectively.)

NOTE
There is no reference line defined for Smith charts, inverted Smith charts, and linear polar or log polar displays.

OFF Command
This command sets the value of the offset associated with the "REFERENCE LINE" in the data graph display.

Changing the scaling-per-division (SCL), the Reference Line position (REF), or the offset value (OFF) in the bottom (secondary) graph of a two graph display is accomplished by using the appropriate suffix mnemonic for that graph, as shown in the table below. For example: to set the scaling value for the phase display of a log/phase type graph, use:

```
"SCL 20 DEG".
```

Command	Graph Type		
	Log Mag / Phase	Lin Mag / Phase	Real / Imaginary
SCL / OFF	DEG / RAD	DEG / RAD	IMU
REF	DEG	DEG	IMU

Graph Type Functions: This function provides for selecting any of the various type of display graphs: Log or Linear Magnitude, Phase, Real, Imaginary, Log or Linear Polar, Smith Chart (Impedance), Smith Chart (Admittance), Group Delay, Power Out, SWR, Log Magnitude and Phase, Linear Magnitude and Phase, Real and Imaginary.

The usage of most of these commands is obvious, except SME, ISE, SMC and ISC.

NOTE

All the commands in the Display Group act on the currently selected active channel (see paragraph 4-3, Channels Group).

Both the SME and ISE commands require an associated data value to be included with the command (Table 4-3). The allowable data values for these commands are: 0, 10, 20, and 30. The example below selects a 20 dB expanded Smith chart on the active channel.

Example: `"SME 20 DBL"`

Commands SMC and ISC also require an associated data value to be included with the command. The allowable data values for these commands are 0 and 3. The example below selects a 3 dB compressed Smith chart on the active channel.

Example: `"SMC 3 DBL"`

The Display key commands are listed in Table 4-3.

Table 4-3. Display Group Commands (1 of 3)

Command	Description
ADD	Select addition as trace math for active channel
APR	Enter group delay aperture setting on active channel
APR?	Output group delay aperture setting on active channel
ASC	Autoscale the active channel display
ASP	Enter polar stop sweep position angle
ASP?	Output polar stop sweep position angle
AST	Enter polar start sweep position angle
AST?	Output polar start sweep position angle
DAT	Display data only on active channel
DAT?	Output trace memory display mode
DIA	Select air as active dielectric
DIE	Enter a dielectric value
DIM	Select microporous teflon as active dielectric
DIP	Select polyethylene as active dielectric
DIT	Select Teflon as active dielectric
DIV	Select division as trace math for active channel
DIX?	Output dielectric constant
DLA	Select group delay display for active channel
DNM	Display data normalized to trace memory on active channel
DTM	Display measurement data and trace memory on active channel
GRF?	Output graph type for active channel
IMG	Select imaginary display for active channel
ISC	Enter scale and select inverted compressed Smith Chart display
ISE	Enter scale and select inverted expanded Smith Chart display
ISM	Select normal inverted Smith Chart for active channel
LIN	Select linear magnitude display for active channel
LPH	Select linear magnitude and phase display for active channel
MAG	Select log magnitude display for active channel
MEM	Display trace memory on active channel
MIN	Select subtraction as trace math for active channel
MPH	Select log magnitude and phase display for active channel
MTH?	Output trace math math type
MUL	Select multiplication as trace math for active channel
OFF	Enter offset value for top graph of active channel
OFF2	Enter offset value for bottom graph of active channel
OFF2?	Output offset value for bottom graph of active channel
OFF?	Output offset value for top graph of active channel
PCP	Select measurement phase polar chart mode
PCS	Select sweep position polar chart mode
PCX?	Output polar chart mode
PHA	Select phase display for active channel
PHO	Enter phase offset for display channel
PHO?	Output phase offset for display channel
PLG	Select log polar display for active channel
PLR	Select linear polar display for active channel
POW	Select power out display for active channel
RDA	Select automatic reference delay calculation
RDD	Enter reference delay in distance for active channel

Table 4-3. Display Group Commands (2 of 2)

Command	Description
RDD?	Output reference delay in distance for active channel
RDT	Enter reference delay in time for active channel
RDT?	Output reference delay in time for active channel
REF	Enter reference line for top graph of active channel
REF2	Enter reference line for bottom graph of active channel
REF2?	Output reference line for bottom graph of active channel
REF?	Output reference line for top graph of active channel
REL	Select real display for active channel
RIM	Select real and imaginary display for active channel
SCL	Enter Scale Resolution for top graph of active channel
SCL2	Enter Scale Resolution for bottom graph of active channel
SCL2?	Output Scale Resolution for bottom graph of active channel
SCL?	Output Scale Resolution for top graph of active channel
SETUP	Display setup menu
SMC	Enter scale and select compressed Smith Chart display
SME	Enter scale and select expanded Smith Chart display
SMI	Select normal Smith Chart for active channel
STD	Store trace to memory on active channel
SWR	Select SWR display for active channel

4-5 MEASUREMENT GROUP

The commands listed in Table 4-4 control sweep and test signal functions. This inicludes frequency, power, attenuation, Hold functions, and Trigger/IF calibration.

Table 4-4. Measurement Group Commands (1 of 3)

Command	Description
AH0	Turn automatic DUT protection off
AH1	Turn automatic DUT protection on
AHX?	Output automatic DUT protection on/off status
BH0	Turn bias off while in hold
BH1	Turn bias on while in hold
BHX?	Output bias on/off during hold status
CNTR	Enter center frequency
CNTR?	Output center frequency
CTN	Continue sweeping from current point
CWF	Enter CW frequency and turn CW on
CWF?	Output CW frequency
CWON	Turn CW on at current CW frequency
CWON?	Output CW on/off status
CWP	Enter number of points drawn in CW
CWP?	Output number of points drawn in CW
FHI	Set data points to 1601
FIL	Fill defined discrete frequency range
FLO	Set data points to 101
FME	Set data points to 401

Table 4-4. Measurement Group Commands (2 of 3)

Command	Description
FP0	Turn flat power correction off
FP1	Turn flat power correction on
FRC	Clear all defined discrete frequency ranges
FRI	Enter Discrete Fill increment frequency
FRP	Enter Discrete Fill number of points
FRS	Enter Discrete Fill start frequency
HC0	Disable internal IF calibration
HC1	Enable internal IF calibration and trigger an IF calibration
HCT	Trigger an IF calibration
HCX?	Output internal IF calibration enable/disable status
HLD	Put sweep into hold mode
HLD?	Output the sweep hold status
IFP	Enter current front panel setup
IFV	Enter frequency values
IS1	Enter front panel setup 1
IS10	Enter front panel setup 10
IS2	Enter front panel setup 2
IS3	Enter front panel setup 3
IS4	Enter front panel setup 4
IS5	Enter front panel setup 5
IS6	Enter front panel setup 6
IS7	Enter front panel setup 7
IS8	Enter front panel setup 8
IS9	Enter front panel setup 9
LA1	Select a1 = Ra as phase lock for parameter being defined
LA2	Select a2 = Rb as phase lock for parameter being defined
LAX?	Output phase lock selection for parameter being defined
NP101	Set data points to 101
NP1601	Set data points to 1601
NP201	Set data points to 201
NP401	Set data points to 401
NP51	Set data points to 51
NP801	Set data points to 801
ONDF	Output number of discrete frequencies
PTP	Enter the target power for flat power correction
PTP?	Output the target power for flat power correction
PW2	Enter external source power level
PW2?	Output external source power level
PWR	Enter internal source power level
PWR?	Output internal source power level
RH0	Select RF off in hold mode
RH1	Select RF on in hold
RHX?	Output RF on/off during hold status
S11	Measure S11 on active channel
S12	Measure S12 on active channel
S21	Measure S21 on active channel
S22	Measure S22 on active channel
SA1	Enter port 1 source attenuator value

Table 4-4. Measurement Group Commands (3 of 3)

Command	Description
SA1?	Output port 1 source attenuator value
SAMP2	Use 2 samplers for measurements
SAMP3	Use 3 samplers for measurements
SAMP?	Output the number of samplers used for measurements
SELSP	Select S-Parameter test set operation
SPAN	Enter frequency span
SPAN?	Output frequency span
SRC2?	Output external source 2 existence information

4-6 ENHANCEMENT GROUP

The commands listed in Table 4-5 control the data enhancement functions of the 37XXX, which include Sequence (Seq), Averaging (Avg), and Utility operations. The operations associated with the Cal key are detailed in Chapter 6, "S-Parameter Calibration Functions.

Seq Key Functions: Sequence enables users to automate a repetitive testing task. A sequence is created by recording a series of keystrokes. After a sequence is created, users can execute these keystrokes by pressing a single key. Sequence also offers subroutine and sequence flow control mechanisms to increase the flexibility of test sequences.

Avg Key Functions: This function provides for averaging the measurement trace and for selecting IF bandwidth values.

Utility Key Functions: This function provides Instrument State Parameters; Remote, Color, and Clock setup operations; and Real Panel, Diagnostics, and General Disk Utilities functions. It also provides for AutoCal characterization.

Table 4-5. Enhancement Group Commands (1 of 1)

Command	Description
AOF	Turn averaging off
AOF?	Output averaging on/off status
AON	Turn averaging on
AVG	Enter averaging count and turn on
AVG?	Output averaging count
IF1	Select 10 Hz IF bandwidth
IF2	Select 100 Hz IF bandwidth
IF3	Select 1 KHz IF bandwidth
IF4	Select 10 KHz IF bandwidth
IFA	Select 30 KHz IF bandwidth
IFM	Select 10 Hz IF bandwidth
IFN	Select 1 KHz IF bandwidth
IFR	Select 100 Hz IF bandwidth
IFX?	Output IF bandwidth
SOF	Turn off smoothing
SOF?	Output smoothing on/off status
SON	Enter smoothing value and turn on
SON?	Output smoothing value

Chapter 5
Calibration Functions

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Chapter 5
Calibration Functions

5-1 INTRODUCTION

This chapter describes the 37XXX S-Paremter error correction (calibration) functions. It describes the commands used to perform the following:

- Specify the calibration method, type, standards, and parameters.
- Control the calibration data-taking process.

NOTES

- See Measurement/Test Signals Group for a description of the flat test port power calibration commands.
- The 37XXX calibration functions require operator intervention. However, it is possible to use the external controller to guide the operator through the calibration process using a suitable program containing the calibration commands described in this chapter.

5-2 RELATED COMMANDS

Related, non-calibration commands used during the calibration process are described in Table 5-1. The use of these commands, in relation to calibration activities, is described throughout this chapter, where appropriate. These command sets are fully described in their respective chapters as indicated in Table 5-1.

NOTE

See **ICx** and **OCx** series commands in the Data Transfer group (Chapter 7) for information on inputting and outputting calibration terms coefficients (error terms).

Table 5-1. Related Commands

Command	Command Function Group
FHI, FLO, FME NP51–NP1601	Measurement Group, Data Points (Ch 5)
SRT, STP, CWF, DFQ, DFD, FRS, FRI, FRP, FIL, FRC	Measurement Group, Frequency (Ch 5)
IFV, ICx, OCx	Data Tranfer Group (Ch 8)
*OPC, *OPC?	IEEE 488.2 Group, Synchronization (Ch 8)
All	Measurement, Test Signals (Ch 5)
All	Display, Graph Type (Ch 5)
All	Display, Scaling (Ch 5)
AVG, AOF. AON	Enhancement, Averaging (Ch 5)
IFA, IFN, IFR, IFM, IF1–IF4	Enhancement, Video IF Bandwidth (Ch 5)
CH1–CH4	Channels Group (Ch 5)

5-3 REQUIRED COMMAND SEQUENCE

A program used to control the calibration process *must* follow a specific order for the GPIB calibration commands that are used. Table 5-2 lists this acceptable order.

Table 5-2. Calibration Command Ordering

Order	Item	Typical Commands Used
1	Calibration Type	C12, C8R, C8T, CRB, CRF, CRR, CBT, CFT, CRT
2	Calibration Method	SCM, OCM, LCM, TCM
3	Line Type	LTC, LTW, LTU
4	Isolation Usage	ISN, ISF
5	Data Points	NOC, DFC, TDC, CWC
6	Frequency:*	
	Sweep	SRT, STP
	Discrete Fill	DFQ, DFD, FRS, FRI, FRP, FIL, FRC,
	User Defined List**	IFV
	CW	
7	Test Port Connector	P1C, P2C
	Connector Type	CMS, CFS, CMK, CFK, CMV, CFV, CMC, CFC, CM2, CF2, CMN, CFN, CM3, CF3, CNG
	User Defined Connector	CND, COO, COS, CC0, CC1, CC2, CC3, CL0, CL1, CL2, CL3
	Offset-Short Values	SH1, SH2
8	Reflection Pairing	MAT, MIX
9	Load Type/Parameters	SLD, BBL, BBZ, BBZL
10	Through Parameters	TOL, TLZ
11	LRL Band	LR2, LR3
12	LRL Parameters	RM1, RRP, LL1, LL2, LL3, LM2, LM3, BPF, ROL, RLZ, RGZ
13	Reference Impedance	LLZ
14	Test Signals*	PWR, SA1, TA2
15	Flat Test Port Calibration *	PTP, PTS, SFC, FP0, FP1
16	Microstrip Parameters	U10, U15, U25, USW, SBT, SBD, USE, USZ
17	Waveguide Param's	WKI, WKD, WCO, WSH1, WSH2
18	Begin Calibration (Data Collection)	BEG
19	Take Cal Data	TCD, TC1, TC2
20	Next Cal Step	NCS

* Refer to Chapter 5, "Measurement Group" for details on these commands.
** See Chapter 8, Measurement Points Data Transfer Commands) CWF

5-4 FUNCTIONAL COMMANDS LISTING

Commands used for special types of calibrations are described in Table 5-3. The commands are used to invoke options and non-standard calibration procedures, and to simulate a calibration process.

Table 5-3. Functional Commands Listing (1 of 2)

Command	Function	Description
NOC	Specify Normal Sweep Calibration	This command sets up a normal frequency range calibration.
DFC	Specify Discrete Frequency Calibration	This command sets up a calibration at discrete frequencies only. Use discrete fill commands to input frequency list for calibration. Refer to Chapter 5, Measurement Functions, paragraph 5-4. Alternatively, the IFV command allows for a frequency list input of calibration frequencies. Refer to "Data Transfer Commands Group (Chapter 8)," for more details.
CWC	Specify CW Calibration	This command sets up a continuous wave (CW) calibration. Use CWF to input CW frequency.
P1C, P2C	Set up to Specify Port 1 (P1C) or Port 2 (P2C) Standards	This command specifies Port 1 or Port 2 as the port to which subsequent connector-related commands will apply. Example: `"P1C;CFK;P2C;CMK"` This sequence of commands sets up a female K connector for port 1 **(P1C CFK)** and a male K connector for port 2 **(P2C CMK).**
CND	Other Connector Specification	This command allows a non-standard connector to be specified. This is the same as selecting OTHER from the front panel menu. When specifying the CND command, the connector offset for the open and/or short device and the capacitance coefficients for the open device also need to be entered to characterize the connector.
SLD, BBL	Specify Sliding Load or Broad Band Load for Calibration	Thie SLD command specifies a sliding load. The data-taking process for the load includes six slide positions. If any frequencies are below 2 GHz, you must also use a broadband load.
LM2, LM3		These commands are used to select a match for the second or the third device respectively during a LRM type calibration.
A12, A8T, A8R, ARF, AFT, ARB, ARR, ABT, ART	Calibration simulation	These commands simulate the completion of a calibration. The Axx series commands must be followed with the corresponding calibration error term coefficients using the ICx commands (see Chapter 8). The Axx series commands match up with corresponding calibration type commands. For example, A12 simulates C12, A8T simulates C8T, etc. **NOTE** If you attempt to apply a calibration without first having entered calibration coefficient data, the error correction may not be applied (as indicated by the Apply Cal LED being momentarily turned on, then off).

Table 5-3. Functional Commands Listing (2 of 2)

Command	Function	Description
CON, COF	Turn on/off vector error correction	These commands are not used during calibration. They are used during normal measurements to apply the current calibration error correction to the measured data (CON) or to turn off error correction calibration (COF).
BEG, TC1, TC2, TCD, NCS, KEC, RPC	Calibration Sequencing and Control commands	These commands are used to start and control the data-taking process. KEC will keep existing calibration error corrections and return to the measurement mode. Command TC1 takes calibration data for the current (calibration) standard for port 1 using a separate forward measurement sweep. Command TC2 performs the same function for port 2 using a separate (reverse) sweep. (Note that command TCD performs these identical operations, using consecutive forward and reverse measurement sweeps.) Using the TC1 and TC2 commands allows one calibration standard of each type to be used for both ports.
U10, U15, U25	Calibration Kit selection commands	These commands are used to select 10, 15, or 25 mil UTF calibration kits respectively. These calibration kits are used to perform a 37XXX calibration for microstrip device measurements.
MAT, MIX	Load match for Reflection devices measurement sequences	The MAT (MATched) command changes the measurement sequence for the standard 12 term, coaxial, two-channel calibration so that the "open" measurements are performed in sequence, followed by the "short" measurements. The MIX (MIXed) command returns to the normal sequence for a two-channel 12 term calibration.

5-5 EXAMPLE PROGRAM

The following is an example of how to set up a calibration sequence for the 37XXX VNA:

```
"SCM;LTC;C12;DFC;FRS 1.0 GHZ;FRI 100 MHZ;FRP 41 XX1;
FIL;DFD;P1C;CFK;P2C;CMK;BBL;BEG"
```

This example code sets up a calibration using standard calibration mode (**SCM**), coax cable media (**LTC**), and 12-term calibration type (**C12**). A discrete set of points is defined for frequency operation starting at 1 GHz (**FRS 1.0 GHZ**), spaced 100 MHz apart (**FRI 100 MHZ**), at 41 consecutive points (**FRP 41 XX1**). This range is confirmed or "filled" (**FIL**), then completed (**DFD**).

The Port 1 test port connector is defined as a female type K connector (**P1C CFK**) and the Port 2 test port connector is defined as a male K type connector (**P2C CMK**). Broadband loads are selected as the default load type (**BBL**). The **BEG** command instructs the 37XXX to begin the calibration-data-taking-process.

The calibration control program should contain commands to control the data-collection portion of the calibration process. Typical commands used for this process are:

- Take Calibration Data for Current Standard (**TCD**, or **TC1**, or **TC2**)
- Go on to the Next Calibration Step (**NCS**)
- Averaging On and Set to Value (**AVG**)
- Set IF Bandwidth to 10 Hz (**IF1**)
- Set IF Bandwidth to 100 Hz (**IF2**)
- Set IF Bandwidth to 1 KHz (**IF3**)
- Set IF Bandwidth to 10 KHz (**IF4**)
- Any Graph Type Specification or Scaling Change
- Active Channel Specification (**CH1–CH4**)

The TCD (or **TC1**, or **TC2**) and **NCS** commands control the data-taking process. Commands **AVG, IFN, IFR, IFA**, and **IFM** control the data-enhancement function used for a particular measurement (refer to Chapter 3, paragraph 5-6, Enhancement Commands).

Before the **TCD** (or **TC1**, or **TC2**) and **NCS** commands are invoked in the program, the system operator must be instructed to perform the *exact* steps necessary to setup the calibration sequence for the type of 37XXX calibration to be used. An example program segment to continue the 12-term calibration started in the previous example is shown on the next page. This example program segment is written in HP-BASIC.

The calibration control program should determine if the 37XXX is ready for the next step of the calibration sequence before prompting

the system operator to connect new calibration standards to the test ports. This can be done by monitoring the status byte of the 37XXX or by waiting for the operation to complete after executing the **NCS** command.

For example, the commands in the following example instruct the 37XXX to take calibration data (**TCD**), go to the next calibration step (**NCS**), then output the number "1" (***OPC?**). When the controller is able to read the number "1" from the 37XXX, the calibration step is complete.

```
260 OUTPUT 706;"TCD;NCS;*OPC?"
270 ENTER 706; N$ ! READ AND DISCARD ASCII '1' WHEN
STEP IS COMPLETE
280 DISP "CALIBRATION STEP COMPLETE"
```

5-6 FLAT TEST PORT CALIBRATION

Signal source power correction data produced during this type of 37XXX calibration is used to flatten the signal power output from the test set port(s) over a specified frequency range. This feature is used to provide flat test stimulus signals to the device-under-test while performing normal measurements.

This process requires operator intervention. The system operator is guided through a sequence of operations and measurements that make up the flat test port calibration sequence. Before attempting to write a GPIB controlled program to produce this calibration sequence, first become thoroughly familiar with the manual procedure.

Flat test port calibrations require considerable time to perform. The time required is dependent upon the number of points selected; For these calibrations, the GPIB timeout value must be increased accordingly, or the control program must generate an appropriate time delay before executing subsequent commands. See the documentation for your GPIB controller for timeout-setting procedures.

The commands listed in Table 5-4 are used to invoke and control flat test port calibrations.

Table 5-6. Flat Test Port Power Commands

Commands	Description
PTP	Enter target power for calibration.
PTP?	Output target power for calibration.
PTS	Selects the number of frequency points (1 – 65) to be skipped between each measured point on the power measurement sweep. It therefore determines the number of points measured on each sweep .
PTS?	Skipped points for flat test port power calibration query.
SFC	Starts the flat test port calibration sequence.
FP1	Causes the flat test port power correction data to be used during normal measurement mode.
FP0	Turns off the flat test port power correction for normal measurement mode.
FPX?	Flat power ON/OFFstatus query.

5-7 CALIBRATION COMMANDS, LISTING

Table 5-5 provides a listing of the commands used to perform measurement calibrations. Unless otherwise noted, all front panel menus mentioned in Table 5-5 are accessed by first pressing the Begin Cal key.

Table 5-5. Calibration Commands (1 of 4)

Command	Description
A12	Simulate 12-term calibration
A8R	Simulate 1-path 2-port calibration reverse path
A8T	Simulate 1-path 2-port calibration forward path
ABT	Simulate trans freq response calibration forward and reverse
AFT	Simulate transmission frequency response calibration forward path
ARB	Simulate reflection only calibration both ports
ARF	Simulate reflection only calibration port 1
ARR	Simulate reflection only calibration port 2
ART	Simulate trans freq response calibration reverse path
BBL	Select broadband load for calibration
BBZ	Enter broadband load impedance for calibration
BBZL	Enter broadband load inductance for calibration
BEG	Begin taking calibration data
BPF	Enter break point frequency for 3 line LRL calibration
C12	Select 12 term calibration
C8R	Select 1-path 2-port calibration reverse path
C8T	Select 1-path 2-port calibration forward path
CBT	Select trans freq response calibration forward and reverse
CC0	Enter capacitance coefficient 0 for open
CC1	Enter capacitance coefficient 1 for open
CC2	Enter capacitance coefficient 2 for open
CC3	Enter capacitance coefficient 3 for open
CF2	Select female 2.4mm connector for current port
CF3	Select female GPC-3.5 connector for current port
CFC	Select female TNC connector for current port

Table 5-5. Calibration Commands (2 of 4)

Command	Description
CFK	Select female K connector for current port
CFN	Select female Type N connector for current port
CFN75	Select Female type N 75-ohm connector for current port
CFS	Select female SMA connector for current port
CFSP	Select Special Female connector for current port
CFT	Select trans freq response calibration forward path
CFV	Select female V connector for current port
CL0	Enter inductive coefficient 0 for short
CL1	Enter inductive coefficient 1 for short
CL2	Enter inductive coefficient 2 for short
CL3	Enter inductive coefficient 3 for short
CM2	Select male 2.4mm connector for current port
CM3	Select male GPC-3.5 connector for current port
CMC	Select male TNC connector for current port
CMK	Select male K connector for current port
CMN	Select male N connector for current port
CMN75	Select Male type N 75-Ohm connector for current port
CMS	Select male SMA connector for current port
CMSP	Select Special Male connector for current port
CMV	Select male V connector for current port
CMX?	Output calibration method
CND	Select user specified connector for current port
CNG	Select GPC-7 connector for current port
COF	Turn error correction off
CON	Turn error correction on
CON?	Output error correction on/off status
COO	Enter offset for open for user specified connector
COS	Enter offset for short for user specified connector
CRB	Select reflection only calibration both ports
CRF	Select reflection only calibration port 1
CRR	Select reflection only calibration port 2
CRT	Select trans freq response calibration reverse path
CSF?	Output cal start frequency
CTF?	Output cal stop frequency
CWC	Select CW frequency calibration data points
CXX?	Output calibration type
DFC	Select discrete frequency calibration data points
DFD	Done specifying discrete frequency ranges
DFQ	Enter single discrete frequency
IC2	Input Calibration Coefficient 2
IC3	Enter calibration coefficient 3
IC4	Enter calibration coefficient 4
IC5	Enter calibration coefficient 5
IC6	Enter calibration coefficient 6
IC7	Enter calibration coefficient 7
IC8	Enter calibration coefficient 8
IC9	Enter calibration coefficient 9
ICA	Enter calibration coefficient 10

Table 5-5. Calibration Commands (3 of 4)

Command	Description
ICB	Enter calibration coefficient 11
ICC	Enter calibration coefficient 12
ICD	Enter corrected data for active channel parameter
ICF	Enter front panel setup and calibration data
ICL	Enter all applicable calibration coefficients for cal type
IFD	Enter final data for active channel parameter
ISF	Exclude isolation
ISN	Include isolation
KEC	Keep existing calibration data
L1C	Perform LO1 internal calibration
L2C	Perform LO2 internal calibration
LCM	Select LRL calibration method
LL1	Enter length of line 1 for LRL calibration
LL2	Enter length of line 2 for LRL calibration
LL3	Enter length of line 3 for LRL calibration
LLZ	Enter line impedance for LRL calibration
LM2	Select a match for the second device during a LRM type calibration
LM3	Select a match for the third device during a LRM type calibration
LR2	Specify 2 line LRL calibration
LR3	Specify 3 line LRL calibration
LTC	Select coaxial transmission line for calibration
LTU	Select microstrip transmission line for calibration
LTW	Select waveguide transmission line for calibration
LTX?	Output line type
MAT	Select matched reflective devices during cal
MIX	Select mixed reflective devices during calibration
NCS	Go to next calibration step
NOC	Select normal calibration data points
OCM	Select offset short calibration method
ONCT	Output number of cal terms for current calibration
P1C	Select port 1 for connector specification
P1C?	Output port 1 connector type
P1P?	Output approximate power level at port 1
P2C	Select port 2 for connector specification
P2C?	Output port 2 connector type
PSP	Enter number of power sweeps for flat power correction (obsolete)
PSP?	Output number of power sweeps for flat power correction (obsolete)
PTS	Enter number of points to be skipped during flat power correction
PTS?	Output number of points to be skipped during flat power correction
RGZ	Select reflective device greater than Z0
RLZ	Select reflective device less than Z0
RM1	Select reference plane at line 1 midpoint
ROL	Enter reflective device offset length
RPC	Repeat previous calibration
RRP	Select reference plane at reflection plane
SBD	Enter substrate dielectric for microstrip calibration
SBT	Enter substrate thickness for microstrip calibration
SCM	Select standard calibration method
SFC	Perform flat test port calibration

Table 5-5. *Calibration Commands (4 of 4)*

Command	Description
SH1	Set offset short 1 or 2 offset length for offset short calibration
SH2	Set offset short 1 or 2 offset length for offset short calibration
SLD	Select sliding load for calibration
SLT	Perform SLT internal calibration
TC1	Take calibration data for port 1
TC2	Take calibration data for port 2
TCD	Take calibration data on one or both ports as necessary
TCM	Select the TRM calibration method
TDC	Select time domain harmonic frequency calibration data points
TLZ	Enter through line impedance for calibration
TOL	Enter through offset length for calibration
U10	Select 10 mil UTF calibration kit
U15	Select 15 mil UTF calibration kit
U25	Select 25 mil UTF calibration kit
USE	Enter effective dielectric for microstrip calibration
USW	Enter microstrip width for microstrip calibration
USZ	Enter microstrip impedance for microstrip calibration
WCO	Enter waveguide cutoff frequency for user defined kit
WKD	Select user defined waveguide calibration kit
WKI	Select installed waveguide calibration kit
WSH1	Enter waveguide short offset 1 for user defined kit
WSH2	Enter waveguide short offset 2 for user defined kit

Chapter 6
Markers and Limits Functions

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Chapter 6
Markers and Limits Functions

6-1 INTRODUCTION

This chapter describes markers and limits commands.

6-2 MARKERS

The commands listed in Table 6-1 (next page) control the location and display of the markers and the functions related to the markers. A full description of each command mnemonic is contained in Chapter 11, Command Dictionary.

A marker is turned on whenever any of the following conditions occur:

- When the marker is set to a value.

  Example: `"MK2 20 GHZ"`

- When the marker is selected for readout.

  Example: `"MR2"`

- When the marker is selected as the delta reference marker (left).

  Example: `"DR2 4.5632 GHZ"`

MMN and MMX Commands — The MMN and MMX commands move the active marker to the minimum and maximum trace values on the active channel, respectively. There must be an active marker selected for these command to execute.

Example: `"WFS;MR1;MMX"`

This code instructs the 37XXX to:

- Wait for a full sweep of data to be present (WFS).
- Turn on marker 1 and select it for readout (MR1).
- Move marker 1 to the maximum value of the trace on the active channel (MMX).

Table 6-1. Marker Commands (1 of 3)

Command	Description
AMKR	Select active marker on all channels marker mode
BWL3	Set bandwidth loss value to 3 dB
BWLS	Enter bandwidth loss value
BWLS?	Output bandwidth loss value
DR1	Select Marker 1 as Delta Reference Marker
DR2	Select Marker 2 as Delta Reference Marker
DR3	Select Marker 3 as Delta Reference Marker
DR4	Select Marker 4 as Delta Reference Marker
DR5	Select Marker 5 as Delta Reference Marker
DR6	Select Marker 6 as Delta Reference Marker
DRF	Turn delta reference mode on
DRO	Turn delta reference mode off
DRO?	Output delta reference mode on/off status
DRX?	Output delta reference marker number
DSF0	Disable filter shape factor calculation
DSF1	Enable filter shape factor calculation
DSFX?	Output filter shape factor calculation enable/disable status
DSQ0	Disable filter Q calculation
DSQ1	Enable filter Q calculation
DSQX?	Output filter Q calculation enable/disable status
FLTBW?	Output filter bandwidth
FLTC?	Output filter center frequency
FLTL?	Output filter loss at reference value
FLTQ?	Output filter Q
FLTS?	Output filter shape factor
FMKR	Select filter parameters marker mode
M1C	Set CW mode at marker 1 frequency
M1E	Set sweep/zoom end to marker 1 frequency distance or time
M1S	Set sweep/zoom start to marker 1 frequency distance or time
M2C	Set CW mode at marker 2 frequency
M2E	Set sweep/zoom end to marker 2 frequency distance or time
M2S	Set sweep/zoom start to marker 2 frequency distance or time
M3C	Set CW mode at marker 3 frequency
M3E	Set sweep/zoom end to marker 3 frequency distance or time
M3S	Set sweep/zoom start to marker 3 frequency distance or time
M4C	Set CW mode at marker 4 frequency
M4E	Set sweep/zoom end to marker 4 frequency distance or time
M4S	Set sweep/zoom start to marker 4 frequency distance or time
M5C	Set CW mode at marker 5 frequency
M5E	Set sweep/zoom end to marker 5 frequency distance or time
M5S	Set sweep/zoom start to marker 5 frequency distance or time
M6C	Set CW mode at marker 6 frequency
M6E	Set sweep/zoom end to marker 6 frequency distance or time
M6S	Set sweep/zoom start to marker 6 frequency distance or time
MK1	Enter marker 1 frequency distance or time and turn on
MK1?	Output marker 1 frequency distance or time
MK2	Enter marker 2 frequency distance or time and turn on
MK2?	Output marker 2 frequency distance or time

Table 6-1. Marker Commands (2 of 3)

Command	Description
MK3	Enter marker 3 frequency distance or time and turn on
MK3?	Output marker 3 frequency distance or time
MK4	Enter marker 4 frequency distance or time and turn on
MK4?	Output marker 4 frequency distance or time
MK5	Enter marker 5 frequency distance or time and turn on
MK5?	Output marker 5 frequency distance or time
MK6	Enter marker 6 frequency distance or time and turn on
MK6?	Output marker 6 frequency distance or time
MKRC	Select interpolated marker functionality
MKRD	Select discrete marker functionality
MKRX?	Output interpolated/discrete marker functionality
MKSL	Marker search left
MKSR	Marker search right
MKT0	Turn marker tracking off
MKT1	Turn marker tracking on
MKTX?	Output marker tracking on/off status
MMN	Move active marker to minimum trace value
MMX	Move active marker to maximum trace value
MO1	Turn off marker 1
MO2	Turn off marker 2
MO3	Turn off marker 3
MO4	Turn off marker 4
MO5	Turn off marker 5
MO6	Turn off marker 6
MOF	Turn marker display off
MON	Turn marker display on
MON?	Output marker display on/off status
MR1	Turn marker 1 on and make it the active marker
MR1?	Output marker 1 on/off status
MR2	Turn marker 2 on and make it the active marker
MR2?	Output marker 2 on/off status
MR3	Turn marker 3 on and make it the active marker
MR3?	Output marker 3 on/off status
MR4	Turn marker 4 on and make it the active marker
MR4?	Output marker 4 on/off status
MR5	Turn marker 5 on and make it the active marker
MR5?	Output marker 5 on/off status
MR6	Turn marker 6 on and make it the active marker
MR6?	Output marker 6 on/off status
MRM	Display the Marker Readout menu
MRX?	Output active marker number
MSFH	Enter high loss value for shape factor calculation
MSFH?	Output high loss value for shape factor calculation
MSFL	Enter low loss value for shape factor calculation
MSFL?	Output low loss value for shape factor calculation
MSR0	Select 0 as reference for marker search and bandwidth calculation
MSRD	Select delta reference marker as reference for marker search and bandwidth calculation
MSRM	Select maximum as reference for marker search and bandwidth calculation
MSRX?	Output reference selection for marker search and bandwidth calculation

Table 6-1. Marker Commands (3 of 3)

Command	Description
NMKR	Select normal markers on active channel marker mode
SMKR	Select marker search marker mode
SRCH	Enter marker search value
SRCH?	Output marker search value
XMKR?	Output marker mode

6-3 LIMITS

The Limits commands perform the functions that are available via the Display key and Limits menus. Figure 6-1 shows the relationship between the major limits commands and the single and segmented limits displays. The various limit-types are described below and the limits commands are listed in Table 6-2 (page 6-).

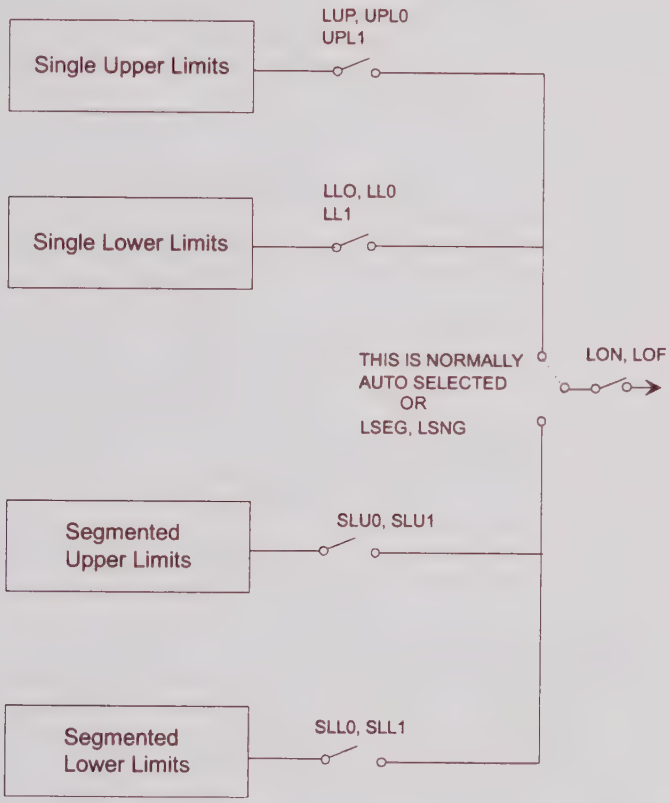

Figure 6-1. *Relationship Between Limits Commands and Limits Displays*

Single (Non-Segmented) Limits

The Non-Segmented Limits Commands do the following:

- Set up the upper and lower limit values for the active channel.
- Set the limit delta for the limit frequency readout function. The range of values and allowable terminator mnemonics are dependent on the graph type of the active channel, much like the SCL and REF commands.

The LFR, LFP, and LFD commands that define limit frequency readouts, are only available on the following graph types: log magni-

tude (MAG), log magnitude and phase (MPH), phase (PHA), linear magnitude (LIN), linear magnitude and phase (LPH), standing wave ratio (SWR), and group delay (DLA). The active channel must be a frequency domain channel. The LFP command can be used to select phase limit frequency readouts on log magnitude and phase and linear magnitude and phase graph types.

To change values for the LFD, LLO, and LUP commands for the bottom graph of two graph display, use the appropriate suffix mnemonic as shown below:

Graph Type	Appropriate Suffix Mneumonic
Log Mag / Phase	DEG / RAD
Lin Mag / Phase	DEG / RAD
Real / Imag	IMU

Segmented Limits Segmented limits (Table 6-4) allow different upper and lower limit values to be set at up to ten segments across the measurement range.

Limits Example This example makes limit 2 the active segment, sets its vertical start to 10 dB, its horizontal start to 10 GHz, its vertical stop to 12 dB, its horizontal stop to 16 GHz, and sets it to display on the 37XXX screen.

```
"SL02;SPV 10 DBL;STH 10 GHZ;SPV 12 DBL;SPH 16 GHZ;
 SLA;SLL;DIS"
```

Limits Pass/FailTesting Limits pass/fail testing commands are listed in Table 6-5. These commands are used to produce a beep and/or a TTL voltage at the rear panel External I/O connector when a measurement exceeds any of the set limits (refer to the 37XXX Operation Manual).

NOTE

Pass/fail testing, when turned on, will generate an SRQ (if enabled) whenever a test failure occurs. Refer to Chapter 7, "Status Reporting" for details.

Table 6-2. Limit Commands (1 of 2)

Command	Description
ATTN	Attach next segment and make the active segment
BEGN	Begin next segment and make it the active segment
CAS	Clear active segmented limit vertical/horizontal definitions
DIS	Display active segmented limit
DIS?	Output active segmented limit on/off status
HID	Hide active segmented limit
LB0	Turn limits testing beep on failure off
LB1	Turn limits testing beep on failure on
LBX?	Output limits testing beeper enable status
LFD	Enter limit frequency readout delta value
LFD2	Enter limit frequency readout delta value for bottom graph
LFD2?	Output limit frequency readout delta value for bottom graph
LFD?	Output limit frequency readout delta value
LFP	Select limit frequency readout for phase displays
LFR	Select limit frequency readout for active channel
LLM?	Output limit line display mode single or segmented
LLO	Enter lower limit value for top graph on active channel
LLO2	Enter lower limit value for bottom graph on active channel
LLO2?	Output lower limit value for bottom graph on active channel
LLO?	Output lower limit value for top graph on active channel
LOF	Limits display off
LOL0	Turn lower limit off
LOL1	Turn lower limit on at current value
LOL20	Turn lower limit off for bottom graph
LOL21	Turn lower limit on at current value for bottom graph
LOL2X?	Output lower limit on/off status for bottom graph
LOLX?	Output lower limit on/off status
LON	Limits display on
LON?	Output limits display on/off status
LPF1?	Output limit test failure status on channel 1
LPF2?	Output limit test failure status on channel 2
LPF3?	Output limit test failure status on channel 3
LPF4?	Output limit test failure status on channel 4
LPF?	Output limit test failure status all channels
LS1	Set lower segmented limit 100 as the active segment
LS10	Select lower segmented limit 10 as the active segment
LS2	Select lower segmented limit 2 as the active segment
LS3	Select lower segmented limit 3 as the active segment
LS4	Select lower segmented limit 4 as the active segment
LS5	Select lower segmented limit 5 as the active segment
LS6	Select lower segmented limit 6 as the active segment
LS7	Select lower segmented limit 7 as the active segment
LS8	Select lower segmented limit 8 as the active segment
LS9	Select lower segmented limit 9 as the active segment
LSEG	Select segmented limit line display mode
LSNG	Select single limit line display mode
LSX?	Output active segmented limit
LT0	Turn limits testing off

Table 6-3. Limit Commands (2 of 2)

Command	Description
LT1	Turn limits testing on
LT1?	Output limits testing enable status
LTST	Display the limits testing menu
LUP	Enter upper limit value for top graph on active channel
LUP2	Enter upper limit value for bottom graph on active channel
LUP2?	Output upper limit value for bottom graph on active channel
LUP?	Output upper limit value for top graph on active channel
LVH	Select high as limits testing TTL level
LVL	Select low as limits testing TTL level
LVX?	Output limits testing ttl level status
SLC	Clear all segmented limits definitions
SLH	Enter segmented limits horizontal offset
SLH?	Output segmented limits horizontal offset
SLL0	Turn lower segmented limits display off
SLL1	Turn lower segmented limits display on
SLLX?	Output lower segmented limits display on/off status
SLU0	Turn upper segmented limits display off
SLU1	Turn upper segmented limits display on
SLV	Enter segmented limits vertical offset
SLV?	Output segmented limits vertical offset
SPH	Enter active segmented limit horizontal stop position
SPH?	Output active segmented limit horizontal stop position
SPV	Enter active segmented limit vertical stop position
SPV?	Output active segmented limit vertical stop position
STH	Enter active segmented limit horizontal start position
STH?	Output active segmented limit horizontal start position
STV	Enter active segmented limit vertical start position
STV?	Output active segmented limit vertical start position
UPL0	Turn upper limit off
UPL1	Turn upper limit on at current value
UPL20	Turn upper limit off for bottom graph
UPL21	Turn upper limit on at current value for bottom graph
UPL2X?	Output upper limit on/off status for bottom graph
UPLX?	Output upper limit on/off status
US1	Select upper segmented limit 1 as the active segment
US10	Select upper segmented limit 10 as the active segment
US2	Select upper segmented limit 2 as the active segment
US3	Select upper segmented limit 3 as the active segment
US4	Select upper segmented limit 4 as the active segment
US5	Select upper segmented limit 5 as the active segment
US6	Select upper segmented limit 6 as the active segment
US7	Select upper segmented limit 7 as the active segment
US8	Select upper segmented limit 8 as the active segment
US9	Select upper segmented limit 9 as the active segment

Chapter 7
Remote-Only Functions

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Chapter 7
Remote-Only Functions

7-1 INTRODUCTION

This chapter describes 37XXX GPIB functions that support operations typically required when in remote mode:

- Data transfers (paragraphs 7-2 through 7-11)
- Error reporting, including the Service Log (paragraphs 7-12 through 7-14)
- Status reporting (paragraphs 7-15, 7-16)
- IEEE 488.2 Common commands (paragraph 7-17)
- Synchronization commands (paragraph 7-18).

7-2 DATA TRANSFER PROTOCOL BASICS

There are several basic ideas associated with transferring data between your controller and the 37XXX. This paragraph introduces data transfer terminology, message terminator and separator characters, and data transfer methods (protocols) used by the 37XXX.

GPIB Messages

A GPIB message is any information sent over GPIB to a device. This includes instrument commands or data that you send to or receive from the 37XXX.

Program Message (PM)

This is the message string that your controller *sends to* the 37XXX.

The message can contain commands, queries (or other requests for data transfer), and data strings.

Response Message

This is the data your controller *receives from* the 37XXX.

The data can contain ASCII or binary represented numerical values, character strings or other arbitrary ASCII data, and 37XXX internally represented binary strings.

Separation and Termination Methods

Termination and separation protocols of messages transmitted over the GPIB are specified by the IEEE 488.2 GPIB Standard. The 37XXX conforms to those specifications as described below.

Message Elements Separator

A program or response message can consist of one or more elements, called units. Units are separated with the semi-colon (;) character.

Units in a program message are complete valid 37XXX commands or queries. For example, "**CH1;PHA;SRT 2 GHZ;SRT?**" consist of four commands or queries that make channel 1 active, set it to phase display, sets start frequency to 2 GHz, then outputs the start frequency.

A single unit in a response message is the complete data output in response to a single command. For example, the command sequence "**ONP;CHX?**" – Output Number of Points and Output Currently Active Channel, will output a response message that contains two units separated by a semi-colon (;). The first unit of data is the response to the **ONP** command. The second unit of data is the response to the **CHX?** query.

Message Unit Data Separator

The comma (,) character separates multiple ASCII data elements of a single command or response message unit. For example, the command **OM1** – Output Marker 1 Value, will output a complex data value (two values, that is, dB and degrees) representing the measurement data at the marker. The two values in the complex data will be separated with a comma.

Message Terminator

A complete program or response message is terminated by sending the linefeed character (0A, or decimal 10) at the same time (concurrent with) setting the EOI state on the GPIB. The notation <0A^END> will be used throughout this Programming Manual to reference the message terminator. Simply put, the message terminator signals the end of transmission.

NOTE

EOI is the GPIB End of Transmission state that is set by the controller, or an instrument, when it is done "talking," i.e. done sending a message on the GPIB and therefore releasing the GPIB for use by another device.

Separation and Termination Example

The following example shows how a program message with multiple units is sent to the 37XXX. Also shown is the response message the 37XXX will send back to the controller.

PROGRAM MESSAGE (to 37XXX):

```
"CH2;LPH;MK6 2.5 GHZ;OM6;OFV".
```

This program message makes channel 2 active (**CH2**), sets it to linear magnitude and phase display (**LPH**), activates and sets marker 6 to 2.5 GHz (**MK6 2.5 GHZ**), outputs its value (**OM6**), then outputs the list of current sweep frequencies (**OFV**).

Response message elements:

<marker 6 dB value>,<marker 6 degrees value>;<frequency list header> <frequency 1>,<frequency 2>,...,<frequency 101><0A^EOI>

NOTE

The (< >) characters in the message elements list are not actually transmitted in the response message; they are shown here in the text to distinguish the various data fields from each other.

A representative response from a Model 37325A:

```
1.00620877743E+00,-3.65609092712E+01;#418
174.00000000000E+7,1.74600000000E+08,...
...,1.35000000000E+100A
```

Response Description:

OM6 outputs 2 ASCII data items (dB,degrees). They are sent separated with a comma (,).

The output of **OM6** and **OFV** is separated with a semicolon (;). This was done because the external controller requested two outputs before reading the first one from the 37XXX.

NOTE:

Note that certain data transfer commands require that you read their output before another data output command is sent [see <Arbitrary ASCII> format and <Arbitrary Block> format (Example 3), in paragraph 7-3].

The **OFV** command outputs data using the <Arbitrary Block> format (see description in paragraph 7-3). The frequency values are preceded by a <frequency list header> (#41817). This is an ASCII text string that is encoded with the number of 7-bit bytes to follow. This data transmission method, used by the **OFV** and other 37XXX block data transfer commands, allows you to prepare an appropriate size memory block to receive the data in your application.

The first frequency value (4.00000000000E+7) is then transmitted immediately after the header followed by a comma. This continues until all 101 frequency values are transmitted.

NOTE:

The commas are used because the values are in ASCII format. If binary format was selected (see **FMA**, **FMB**, **FMC** format commands, paragraph 7-4), the frequency values would have been sent without commas.

The linefeed character (**0A**) signals the end of transmission at the end of the response message. The end of transmission **(EOI)** is set by the 37XXX at the same time the linefeed is sent and thus the GPIB is released for use by another device.

7-3 DATA TRANSMISSION METHODS

Data transmissions to and from the 37XXX conform to the protocols specified by the IEEE 488.2 GPIB Standard. The 488.2 Standard specifies how any data, such as ASCII numbers, strings, or blocks of data bytes, will be transmitted over the GPIB. This paragraph describes the various transmission methods in use by the 37XXX.

The transmission method names described below (also called notations) will be used throughout the Programming Manual when describing specific 37XXX data transfer commands.

Data transmission notations are easily distinguished in text as they are always shown surrounded by the "less than" and the "greater than" characters (< >). The transmission type notations used in describing various 37XXX data transmissions are:

For ASCII numbers, the notations are:

<NR1>, <NR2>, <NR3>, or <NRf>

For ASCII strings (printable characters and print formatting codes), the notation is:

<ASCII String>

For generic (7-bit) ASCII characters, the notation is:

<ASCII Block>.

For generic binary bytes, (i.e. 7-bit ASCII or binary), the notation is:

<Arbitrary Block>

<NR1>

This notation represents ASCII integer values. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR1> notation:

1
0
-29,179

<NR2>

This notation represents ASCII floating point values in decimal point format. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR2> notation:

1.0
-0.00015
12.743,-180.07

<NR3>

This notation represents ASCII floating point values in exponential format (scientific notation). A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR3> notation:

1.0E9
-7.056E3
9.0E-2,3.42E2

<NRf>

This notation is used to signify that data can be in either <NR1>, <NR2>, or <NR3> format as described above.

Examples of values that can be represented by <NRf> notation:

1.0E-9
10.005
-83,4.5E2,-234.9901

<String>

This notation represents a string of 7-bit ASCII characters (including non-printable characters) that is delimited (surrounded) with either single quotes (' ') or double quotes (" "). The string can include text formatting characters such as linefeed, space, or carriage return.

Note that if a double quote character must be sent as part of the string, then it must be followed by an additional double quote. Alternatively, the string can be sent using single quotes (See "cal_file" example below).

Examples of data represented by <String> notation:

"1/15/98"
"Save ""cal_file"" now."
'Save "cal_file" now.'

<Arbitrary ASCII>

This notation represents undelimited 7-bit ASCII text. The end of the text must be terminated with the 0A character (decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI). This requirement makes it necessary for <Arbitrary ASCII> text to be transmitted only at the end of a program or response message, i.e. at the end of a multiple input or output statement.

Example of data represented by <Arbitrary ASCII> notation:

ANRITSU,37247A,123456,1.0<0A^EOI>

The example shows a sample response from the *IDN?, 488.2 common query. In the example, the instrument identifies itself as a ANRITSU 37247A, with serial number 123456, and software version 1.0 installed.

Note that decimal 10 (0A character) must be sent with the EOI to signal end of transmission

<Arbitrary Block>

This notation represents data that is transmitted as 7-bit data bytes (00–FF hex, 0–255 decimal, notation is <DAB>). This is useful for transmitting large blocks of formatted ASCII or binary data or unformatted binary data. The data stream is immediately preceded by a variable length ASCII header that is encoded with the number of data bytes to be sent. The header always starts with the pound (#) character. Figure 7-1 below describes the header and the transmitted data messages.

#nm1..mn<DAB>1..<DAB>m

Where:

# = The pound sign character. Required for binary data transfer.
n = Number of digits to follow ($m_1..m_n$) that make up the number m.
$m_1..m_n$ = Taken together, this makes up the number m which is the number of data bytes to follow that constitute the requested data.
<DAB> = An 8 bit binary data byte. This is the data (or information) being sent.

NOTE

If n = 0, then m is omitted, and transmission end is signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End Of Transmission State (EOI) immediately following the last <DAB>.

Figure 7-1. *<Arbitrary Block> Data Format*

EXAMPLE 1 : #3204<DAB_1>...<DAB_{204}>

Example 1 shows how 204 7-bit bytes are transmitted using the proper header. The header in this example is comprised of 5 characters (#3204). It begins with with the pound character (#). The next character (3) indicates there are 3 digits to follow that indicate the number of bytes being transmitted (204). The next three characters (204) indicate the number of data bytes being transmitted immediately after the header. Next comes the actual data bytes, or information, being transmitted (<DAB_1>...<DAB_{204}>).

EXAMPLE 2: #512808<DAB_1>...<DAB_{12808}>

Example 2 shows how 12808 7-bit bytes are transmitted using the proper header. The header in this example is comprised of 7 characters (#512808). It begins with with the pound character (#). The next character (5) indicates there are 5 digits to follow that indicate the number of bytes being transmitted (12808). The next five characters (12808) indicate the number of data bytes being transmitted immediately after the header. Next comes the actual data bytes, or information, being transmitted (<DAB_1>...<DAB_{12808}>).

NOTE:

Examples 1 and 2 above demonstrate the <Arbitrary Block> form referred to as <*Definite* Length Arbitrary Block>. It is so called because the number of data bytes being transmitted is *known* from the encoded header.

EXAMPLE 3: #0<DAB_1>...<DAB_n><0A^EOI>

Example 3 shows how an *unknown* number of 7-bit bytes are transmitted using the proper header. The header in this example is comprised of 2 characters (#0). As usual, the header begins with the pound character (#). The next character (0) indicates there is an unknown number of data bytes being transmitted immediately after the header. Next comes the actual data bytes being transmitted (<DAB_1>...<DAB_n>). The end of the data stream is signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI).

NOTES:

- Example 3, above, demonstrates a special form of the <Arbitrary Block> referred to as the <*Indefinite* Length Arbitrary Block>. It is so called because the number of data bytes being transmitted is unknown, and therefore can not be encoded in the header. Instead, the header *always* consists of the pound and zero characters (#0) and end of the data stream is *always* signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI). This requirement makes it necessary for <*Indefinite* Length Arbitrary Block> text to be transmitted only at the end of a program or response message, i.e. at the end of a multiple input or output statement.

- When using this method to input data you must not exceed the 37XXX input buffer size (refer to Chapter 1, Table 1-2.)

Three commands are provided to alter the way the arbitrary block header for output data is formed.

FDH0: Specifies that the length of the arbitrary block header will be minimized; that is, the byte count section will not contain leading zeros, thus its length is indeterminate. This means that a program must decode the header in order to skip over it.

FDH1: Specifies that the length of the arbitrary block header will be fixed at 11 characters. This is accomplished by forcing leading zeros as required in the byte count section. This means that a program can skip over the arbitrary block header by skipping 11 characters.

FDH2: Specifies that no arbitrary block header will be sent with the next transmission. This mode is not in compliance with IEEE 488.2 specifications and will only be in effect for the current program message. Afterwards, it will change to FDH1.

FDHX?: FDH mode query.

7-4 SELECTING ASCII OR BINARY DATA FORMAT

The following paragraphs discuss the various data output formats.

- Data transfers *involving* numerical data arrays.
- Data transfers *not involving* numerical data arrays.
- Enhanced ASCII formatting.

Non-Array Data

The formats used for data transfers *not* involving numerical data arrays are preset. They always occur in either binary format or ASCII format, depending on the data.

These data transfers include a variety of information. Examples include: instrument setup strings, marker data, queries, and disk directory listings. See the desired data transfer command description for its applicable data transfer format.

Numerical Data Arrays

Numerical data array transfers are used to transfer the following types of data:

- Measurement data
- Calibration data
- Sweep frequency, time, or distance values.

Each of these data transfer types are individually explained in following paragraphs.

You can select either binary or ASCII format for data transfers involving numerical data arrays. The five commands described below will select and keep the format for all subsequent transfers (these commands are also listed and described in Table 7-1).

ASCII Format:

FMA: ASCII formatted values represented in <NR1>, <NR2>, <NR3>, or <NRf> formats as described in paragraph 7-3. The 37XXX will accept any of the above formats as input. It will *always* output values us-

ing <NR3> exponential format with each value represented using 18 characters, plus a comma to separate multiple values.

Binary Format:

FMB: Each *eight* consecutive data bytes represent one floating point value in IEEE 754 64-bit format (double precision, 8 byte, floating point value).

FMC: Each *four* consecutive data bytes represent one floating point value in IEEE 754 32-bit format (single precision, 4 byte, floating point value).

FMX?: FMA, FMB, FMC format selection query.

MSB: Byte ordering is *most* significant byte first. For use only with FMB and FMC. This the default byte ordering mode for the 37XXX.

LSB: Byte ordering is *least* significant byte first. For use with FMB and FMC. This is required for transferring data to/from Intel/IBM based computers.

XSB?: MSB, LSB format selection query.

FMT0: Turn ASCII enhancement off (normal default mode).

FMT1: Turn ASCII enhancement on.

FMTX?: ASCII enhancement ON/OFF status query.

Enhanced ASCII Formatting

Enhanced ASCII formatting can be applied to both non-array ASCII data and numerical data arrays in the FMA format when this data is output within an <arbitrary block> format. The format selectively replaces comma data element separators with a line feeds (ASCII 10) in order to enhance the visual effect. Figure 7-2 provides two examples of this enhanced structure.

7-5 DATA TRANSFER COMMANDS LISTINGS

Table 7-1 is an alphabetical listing of all data transfer commands. Tables 7-2 through 7-4 list these commands separately, with each table listing the commands for a particular data transfer type. These tables are located with the explanatory paragraphs.

A Note On Query Commands

Query commands are a special form of data transfer commands. They are used to query (or output) a variety of 37XXX setup parameters. For example, **SRT?** will output the current sweep start frequency. Query command mnemonics typically closely resemble the corresponding setup command mnemonic but with an added question mark (?). For example, **CH1** is used to set the active channel to channel 1, **CHX?** is used to query the currently active channel setting. Query commands are listed in their respective Command Function Group

chapter. For example, since **SRT?** queries a Measurement Function, it will be listed in Chapter 4, Measurement Group.

Error And Status Reporting Commands Commands associated with transferring error and status reporting data are described in detail in paragraphs 7-11 and 7-15 respectively.

An unenhanced directory listing

```
#9000000392Directory of  C:\   1-30-96  13:03,UTIL         <DIR>        1-25-96  12:58,PLOT
     BMB      38462   1-22-96  14:41,PLOT     BMC     307446   1-22-96  14:41,TTT      CAL
           44174   1-22-96  17:02,TTT2     CAL      44174   1-22-96  17:16,PLOT1    DAT
             10323   1-22-96  14:03,PLOT1    HGL      19899   1-22-96  14:02,PLOT2    HGL
                 38462   1-25-96  13:16,8 Files          502940 Bytes
```

An enhanced directory listing

```
#9000000392
Directory of  C:\   1-30-96  13:03
UTIL          <DIR>          1-25-96  12:58
PLOT      BMB        38462   1-22-96  14:41
PLOT      BMC       307446   1-22-96  14:41
TTT       CAL        44174   1-22-96  17:02
TTT2      CAL        44174   1-22-96  17:16
PLOT1     DAT        10323   1-22-96  14:03
PLOT1     HGL        19899   1-22-96  14:02
PLOT2     HGL        38462   1-25-96  13:16
8 Files             502940 Bytes
```

An unenhanced response to OCD

```
#9000000189-9.99750733376E-01, 3.21409821510E-01, 3.60706359148E-01, 9.82860028744E-01, 7.7
6742696762E-01,-5.06587028503E-01,-5.07535457611E-01,-8.45697641373E-01,-6.10321164131E-01,
 6.05827927589E-01
```

An enhanced response to OCD

```
#9000000189
-9.99750733376E-01, 3.21409821510E-01
 3.60706359148E-01, 9.82860028744E-01
 7.76742696762E-01,-5.06587028503E-01
-5.07535457611E-01,-8.45697641373E-01
-6.10321164131E-01, 6.05827927589E-01
```

Figure 7-2. *Examples of Enhanced ASCII Formatting*

Table 7-1. Alphabetical Listing of All 37XXX Data Transfer Commands (1 of 2)

Command	Description
DPR0	Visible data only OFD format
DPR1	Data pair always OFD format
FMA	Select ASCII data transfer format
FMB	Select IEEE754 64 bit data transfer format
FMC	Select IEEE754 32 bit data transfer format
FMX?	Output data output mode FMA FMB or FMC
IC1	Enter calibration coefficient 1
IC10	Enter calibration coefficient 10
IC11	Enter calibration coefficient 11
IC12	Enter calibration coefficient 12
LSB	Select least significant byte first binary transfer
MSB	Select most significant byte first binary transfer
OAM1	Output channel 1 active marker value
OAM2	Output channel 2 active marker value
OAM3	Output channel 3 active marker value
OAM4	Output channel 4 active marker value
OC1	Output calibration coefficients 1
OC10	Output calibration coefficients 10
OC11	Output calibration coefficients 11
OC12	Output calibration coefficients 12
OC2	Output calibration coefficients 2
OC3	Output calibration coefficients 3
OC4	Output calibration coefficients 4
OC5	Output calibration coefficients 5
OC6	Output calibration coefficients 6
OC7	Output calibration coefficients 7
OC8	Output calibration coefficients 8
OC9	Output calibration coefficients 9
OCA	Output calibration coefficient A
OCB	Output calibration coefficient B
OCC	Output calibration coefficient C
OCD	Output corrected data for active channel parameter
OCF	Output front panel setup and calibration data
OCL	Output all applicable calibration coefficients for cal type
ODR	Output directory listing of the floppy drive
ODRH	Output directory listing of the hard drive
ODV	Output distance values for time domain
OEL	Output error list
OFD	Output final data for active channel parameter

Table 7-1. Alphabetical Listing of All 37XXX Data Transfer Commands (2 of 2)

Command	Description
OFP	Output current front panel setup
OFV	Output frequency values
OGE	Output extended description of current GPIB error
OGL	Output extended description of previous GPIB error
OID	Output instrument identification string
OLM	Output limits status byte mask
OM1	Output marker 1 value
OM2	Output marker 2 value
OM3	Output marker 3 value
OM4	Output marker 4 value
OM5	Output marker 5 value
OM6	Output marker 6 value
ONCP	Output number of points for current calibration
ONE	Output number of lines in the error list
ORD	Output raw data for active channel parameter
OS1	Output front panel setup number 1
OS10	Output front panel setup number 10
OS2	Output front panel setup number 2
OS3	Output front panel setup number 3
OS4	Output front panel setup number 4
OS5	Output front panel setup number 5
OS6	Output front panel setup number 6
OS7	Output front panel setup number 7
OS8	Output front panel setup number 8
OS9	Output front panel setup number 9
OSL	Output service log
XSB?	Output byte order for output data LSB or MSB

7-6 SWEEP MEASUREMENT POINTS DATA TRANSFER

The Sweep Measurement Points Data Transfer Commands are listed in Table 7-2. These commands are described in the following paragraphs.

The OFV command

Output Frequency Values, will output the current sweep measurement frequencies.

The OTV command

Output Time Values, and the **ODV** command - Output Distance Values, will output the current time domain sweep measurement points.

The IFV command

Used to input a user defined set of frequencies for measurement or calibration.

> ***NOTE***
>
> The **IFV** command will delete the existing sweep frequency list and replace it with the newly input list. Therefore all existing calibration data will be lost.

The ONP command

Output Number of Points, can be used to allocate enough memory in your program to receive the measurement frequencies. For example, sending "**ONP;OFV**" to the 37XXX when a 401 data point sweep is in progress will output the ASCII value 401. This value can now be used to set up an array of the correct size to receive the output of the **OFV** command.

Table 7-2. *Sweep Measurement Points Data Transfer Commands*

Command	Brief Description	Allowable Data Formatting
ODV	Output distance values for time domain sweep points	FMA, FMB, FMC
IFV	Input frequency list	FMA, FMB, FMC
OFV	Output measurement frequency values	FMA, FMB, FMC
OGCFV	Output gain compression frequency values	FMA, FMB, FMC
ONP	Output number of points currently being measured	None - Always ASCII
ONPV	Output the number of power sweep power values	None - Always ASCII
OPSV	Output power sweep power values	FMA, FMB, FMC
OTV	Output time values for time domain measurement points	FMA, FMB, FMC

Sweep Measurement Points Data Transfer Example

The following is an example of Sweep Measurement Points Data Transfer commands usage:

```
"NP101;FMB;LSB;OFV"
```

These commands will perform the following functions:

NP101 will set up a 101 point sweep.

FMB will output data using 64-bit (eight bytes) floating-point format.

LSB causes data bytes to be output least significant byte first. This is for compatibility with INTEL/IBM based computer/controllers. If using other types of controllers that represent data in most significant byte format, then use the **MSB** command.

OFV uses the <Arbitrary Block> format. It will output the current list of measurement frequencies, f_1 thru f_{101}, using eight bytes each. The ASCII header (#3808), which shows that 808 data bytes follow, precedes the frequency values. The linefeed character (0A, decimal 10) signals the end of the data block.

EXAMPLE:

#3808<f_1, 8 bytes>...<f_{101}, 8 bytes>0A

NOTE:
The (< >) characters are not output from the 37XXXX. They are used in the text above to distinguish each frequency's 8 byte segments.

7-7 FAST CW OPERATION

Fast CW operation is a special mode where the instrument is in CW and measurements are made very rapidly. The measurement data is sent directly to the GPIB task which can either make the data available to the GPIB bus or store it in an internal buffer to be output later. To achieve a faster measurement rate, the display is not updated. See the next paragraph on Internal Buffer Data Collection for a description of how the Fast CW Data can be stored in an internal buffer and output at a later time.

There are currently 2 modes for fast CW: Mode 1 outputs the active channel S-Parameter or User Defined Parameter as a complex number. Mode 2 outputs the measurements B1, B2 and A as 3 complex numbers. When the data is output to the GPIB directly, it is output one point at a time. No intervening query mnemonics are required. The byte order of the floating point numbers is always Most Significant Byte first (MSB). If a data points is not read when available, it may be overwritten by a subsequent data point and lost. No indication is made if this happens as it is very likely that many data points will be lost if the controller is not fast enough to keep up with the measurement rate.

Fast CW Mode 1 Each data point is output in binary and consists of two IEEE 754 4-byte floating point numbers (one for the real part and one for the imaginary) encapsulated within an <arbitrary block> header (paragraph 7-3) and a trailing Line Feed with EOI. A total of 12 bytes:

#18 <4-byte float> <4-byte float><LF/EOI>

Fast CW Mode 2 Each data point is output in binary and consists of 3 sets of IEEE 754 4-byte floating point numbers (one for the real part and one for the imaginary) encapsulated within an <arbitrary block> header (paragraph 7-3) and a trailing Line Feed with EOI. A total of 29 bytes. The parameter order is [B1][B2][A1] for the forward sweep direction and [B1][B2][A2] for the reverse sweep direction:

#224<4-byte float><4-byte float><4-byte float> <4-byte float><4-byte float><4-byte float><LF/EOI

Most GPIB mnemonics interfere with proper Fast CW operation and are therefore not permitted. Refer to Table 7-3 for a list of Fast CW mnemonics and Table 7-4 for a list of Fast CW permitted mnemonics.

Table 7-3. Fast CW Mnemonics (1 of 1)

Command	Description
FCW0	Turn fast CW measurement mode off
FCW1	Turn fast CW measurement mode on
FCW2	Turn Fast CW mode 2 on
FCWX?	Output fast CW measurement mode on/off status

Table 7-4. Mnemonics Permitted During Fast CW Mode (1 of 1)

Command	Description
ADDFC	Enter frequency counter GPIB address
ADDPLT	Enter plotter GPIB address
ADDPM	Enter power meter GPIB address
SAMP2	Use 2 samplers for measurements
SAMP3	Use 3 samplers for measurements

7-8 INTERNAL BUFFER DATA COLLECTION

Internal Buffer Data Collection (Table 7-5) provides for saving active channel measurement data from multiple sweeps without having to synchronize and collect data at the end of each sweep. The instrument can store up to 20,000 data point measurements; each one consisting of two IEEE 754 4-byte floating point numbers.

The mnemonics CCD, CFD and CRD initialize the collection process and specify which type of data will be collected: either Corrected Data, Final Data or Raw Data respectively. The measurement data in Fast CW mode is considered to be Raw Data. Once initialized, the collection process can be started by issuing the mnemonic DCCTN.

Before changing instrument parameters, temporarily suspend the collection process with the mnemonic DCHLD. After changes are completed, restart with DCCTN.

Sections of collected data can be delimited using the mnemonic DCMRK, which puts user specified values into the data buffer in real time.

The mnemonic OCS will output the data and reset the data collection buffer. The output format is fixed at FMC and DPR1. The user may, however, specify MSB or LSB. As is the case with all binary data transfers, the data will be encapsulated with an Arbitrary Block header (paragraph 7-3). The size of the output data is 2 X 4 X number of data points collected. The maximum size is 160,000 bytes. If the internal buffer becomes completely filled, subsequent data is discarded. The CBF bit of the Extended Event Status Register will also be set.

Table 7-5. Internal Buffer Data Collection Mnemonics (1 of 1)

Command	Description
CCD	Collect corrected data in an internal buffer
CFD	Collect final data in an internal buffer
CRD	Collect raw data in an internal buffer
CXD?	Output internal buffer data collection mode
DCCTN	Resume internal buffer data collection
DCCTN?	Output internal buffer data collection resume/suspend status
DCHLD	Suspend internal buffer data collection
DCMRK	Inserts the mark value into the internal buffer
DCOFF	Turn internal buffer data collection mode off
OCS	Output internal buffer collected data

7-9 TRIGGERS

Table 5-4, in Chapter 5, lists the mnemonics TEX and TIN which control the triggers that are visible from the front panel. There are, however, two additional trigger configurations controllable only from the GPIB.

The mnemonic TIB sets up the instrument similar to TEX except the GPIB Group Execute Trigger provides the trigger to got to the next frequency and take a measurement. Thus the user can cause the instrument to step along and take measurements as quickly or as slowly as desired. If the instrument has not finished with the measurement cycle from a previous GET and another GET is received, the GET will be lost. To show that this has happened, the TRH bit in the Limit Event Status Register is set.

The mnemonic TEB allows the rear panel external trigger to execute the program message contained in the *DDT trigger definition. This allows the rear panel trigger to control almost any instrument function(s) that can be controlled from the GPIB. Such as restarting the sweep, or even resetting the instrument. If the instrument has not finished with the *DDT trigger definition when another rear panel trigger is received, the trigger will be lost. To show that this has happened, the TRH bit in the limit event status register is set.

Table 7-6 contains all the trigger mnemonics. Table 7-7 shows the relationships set up by the various trigger modes.

Table 7-6. Trigger Mnemonics (1 of 1)

Command	Description
TEB	Select external trigger executes *DDT definition
TIB	Select GPIB measurement triggering

Table 7-7. Trigger Relationships (1 of 1)

Trigger Mode	Data Measurement	*DDT Trigger Definition
TIN	Internal	GPIB GET
TEX	External	GPIB GET
TIB	GPIB GET	None
TEB	Internal	External

7-10 CALIBRATION COEFFICIENTS DATA TRANSFER

The Calibration Coefficients Data Transfer commands are listed in Table 7-8. These commands are described in the following paragraphs.

The **OCx** and **ICx** commands provide for outputting and inputting calibration error terms (coefficients). The **ONCT** command outputs the number of error terms available for the currently set calibration. For example, **ONCT** would output the number 12 for a 12-Term calibration and 2 for a Transmission Frequency Response calibration. The ordering of the calibration error terms for the various calibration types is shown in Chapter 12, Table 12-3. For example, to output the ETF error term from a 12-Term calibration use the **OC4** command.

Table 7-8. *Calibration Coefficients Data Transfer Commands*

Command	Brief Description	Allowable Data Formatting
IC1 – IC12	Input calibration coefficient 1-12	FMA, FMB, FMC
ICA, ICB, ICC	Input calibration coefficient 10–12	FMA, FMB, FMC
OC1 – OC12	Output calibration coefficient 1–12	FMA, FMB, FMC
OCA, OCB, OCC	Output calibration coefficient 10, 11, 12	FMA, FMB, FMC
OCL	Output all 12 calibration coefficients	FMA, FMB, FMC
ONCT	Output number of cal terms for current calibration	None - Always ASCII

The **ICx** commands are used to input user defined calibration error terms. The 37XXX must be prepared to accept the appropriate calibration error terms using the Simulate Calibration commands, such as **A12**, **A8T**, etc.. These commands use the same mnemonic syntax as their related calibration selection commands (which are used to actually perform a calibration), except they start with the letter "A" instead of "C". For example, the **A12** command is used to simulate a 12-Term calibration where as the command **C12** is used to actually perform a 12-Term calibration. Similarly, the **A8T** command is used to simulate a 1 Path 2 Port FWD calibration where as the command **C8T** is used to actually perform a 1 Path 2 Port FWD calibration. Refer to Chapter 12, Table 12-3 and to Chapter 6, "Calibration Functions" for more information about calibration coefficients, and performing calibrations).

Calibration error terms (coefficients) are output, or expected as input, only for the currently defined set of sweep frequencies. If data points are not at the maximum values set during calibration and/or the frequency range has been zoomed-in (with error correction turned on), not all calibration coefficients will be output or used as input. Refer to paragraph 7-6, "Sweep Measurement Points Data Transfer," for details on outputting the current sweep measurement points.

If an attempt is made to transfer an unavailable calibration error term, that is, the EXR term from a Reflection Only calibration, the 37XXX will issue an Execution Error (refer to paragraph 7-12, "The 37XXX Error Reporting System").

Calibration Coefficients Data Transfer Example

The following is an example usage of Calibration Coefficients Data Transfer commands:

```
"NP101;ONCT;FMB;LSB;OC1"
```

These commands will perform the following functions:

NP101 will set up a 101 point sweep. This is only allowed if the calibration was done with at least 101 points in the sweep.

ONCT will output the number 12, since there are 12 error terms in a 12-term calibration.

The 37XXX will then output a semi-colon (;) to separate the **ONCT** output data from the oncoming **OC1** data.

FMB will output the calibration data using 64-bit (eight bytes) floating-point format.

LSB causes data bytes to be output least significant byte first. This is for compatibility with INTEL/IBM based computer/controllers. If using other types of controllers that represent data in most significant byte format, then use the **MSB** command.

OC1 uses the <Arbitrary Block> format. It will output 101 real and imaginary data pairs (202 values). Each two consecutive values, 8 bytes each, represent the error term EDF at each measurement point. The total number of bytes expected (1616) is encoded in the ASCII header (#41616). The linefeed character (0A, decimal 10) signals the end of the data block.

EXAMPLE:

12;#41616<f_1 EDF real, 8 bytes> <f_1, EDF imaginary, 8 bytes> <f_2 EDF real, 8 bytes> <f_2, EDF imaginary, 8 bytes>...
....<f_{101}, EDF real, 8 bytes> <f_{101}, EDF imaginary, 8 bytes>**0A**

NOTES:

- The (< >) characters shown in the example are not output from the 37XXX. They are used in the text above to distinguish each 8 byte data segments.
- Note the number 12, output in response to the **ONCT** command, and the semi-colon separator, that precede the EDF data output.

Your program can now iteratively issue and output the remaining 11 error terms using the commands **OC2**, **OC3**, ..., **OC12**.

7-11 MEASUREMENT DATA TRANSFER

The Measurement Data Transfer commands are listed in Table 7-9 . These commands are described in the following paragraphs.

Table 7-9. Measurement Data Transfer Commands

Command	Brief Description	Allowable Data Formatting
DPR0	Turn **off** outputting of data pairs for single graph data types only (when using OFD/IFD command)	N/A
DPR1	Turn **on** outputting of data pairs for single graph data types only (when using OFD/IFD commands)	N/A
DPRX?	Data pair mode query on/off.	N/A
ICD	Input corrected data for S-parameter on active channel	FMA, FMB, FMC
IFD	Input final (display format) data for S-parameter on active channel	FMA, FMB, FMC
OAM1–OAM4	Output active marker value on channel indicated	None - Always ASCII
OGCFD	Output gain compression final data to GPIB	FMA, FMB, FMC
OCD	Output corrected data for S-parameter on active channel	FMA, FMB, FMC
OFD	Output final (disp. format) data for S-parameter on active channel	FMA, FMB, FMC
OM1 – OM6	Output marker 1-6 value in display format. NOTE: Use MK1?-MK6? to output marker frequency. Refer to Chapter 6, Data Analysis, for more details.)	None - Always ASCII
OS11C	Output corrected S11 data to GPIB	FMA, FMB, FMC
OS11R	Output raw S11 data to GPIB	FMA, FMB, FMC
OS12C	Output corrected S12 data to GPIB	FMA, FMB, FMC
OS12R	Output raw S12 data to GPIB	FMA, FMB, FMC
OS21C	Output corrected S21 data to GPIB	FMA, FMB, FMC
OS21R	Output raw S21 data to GPIB	FMA, FMB, FMC
OS22C	Output corrected S22 data to GPIB	FMA, FMB, FMC
OS22R	Output raw S22 data to GPIB	FMA, FMB, FMC

The measurement data transfer commands are used to transfer S-parameter values to or from the currently active channel. Only the currently set number of measurement points will be output or expected as input. Refer to paragraph 7-6, "Sweep Measurement Points Data Transfer," for details on outputting the current sweep measurement points.

The **OAM1-OAM4, OFD/IFD** and **OM1-OM6** commands - Output/Input Final Display Formatted Data or marker value, transfer data val-

ues in the currently selected graph type units. If a dual graph type is displayed, such as Log Magnitude and Phase, the data for each measurement point will be a pair of values. In the case of Log Magnitude and Phase, the data pair would be (dB value, degrees value). If a single graph type is displayed, such as Log Magnitude only, the data for each measurement point will be a single value, in this case (dB value).

The **DPR1** command - Data Pair Format On, modifies the **OAM1-OAM4, OFD/IFD** and **OM1-OM6** commands to transfer a complex data pair *when in a single graph type* display (that is, Phase only). Necessarily though, since it was not an actually measured value, the additional value will be set to zero. The output values for each graph type selection for both the DPRx modes are listed in Table 7-10.

Table 7-10. *Output Value vs Graph Display Types*

Graph Display Type	Data Units and Ordering	
	w/DPR0	w/DPR1
Log magnitude	dB	dB, 0
Phase	degrees	0, degrees
Log mag & phase	dB, degrees	dB, degrees
Linear magnitude	Rho or Tau, degrees	Rho or Tau, 0
Linear mag & phase	Rho or Tau, degrees	Rho or Tau, degrees
Smith chart	Ohms	Ohms, j-Ohms
Inverted Smith	Siemens	Siemens, j-Siemens
Group delay	Seconds	Seconds, 0
Log polar	dB, degrees	dB, degrees
Linear polar	Rho or Tau, degrees	Rho or Tau, degrees
Real	Real	Real, 0
Imaginary	Imag	0, imag
Real & Imaginary	Real, imag	Real, imag
SWR	SWR	SWR, 0

NOTE:
The **DPR1** format will remain in effect until the 37XXX receives the **DPR0** command — that is, Data Pair Format Off. This mode is the default data transfer format.

For example, if the current graph type is Phase only, "**DPR1;OFD**" would output data pairs in the same format as if Magnitude and

Phase dual graph type was currently displayed, but with the magnitude value set to zero (0, degrees value). Similarly, if the current graph type is Log Magnitude only, "**DPR1;OFD**" would output data pairs in the same format as if the Magnitude and Phase dual graph type was currently selected, but with the phase value set to zero (dB value, 0).

The **DPR1** functionality is useful in developing a single data transfer procedure in your application program for processing all data output commands; since they mostly transfer a data pair. This includes the **OAM1-OAM4, OFD**, **IFD**, and **OM1-OM6** measurement data transfer commands discussed here, and the **ICx** and **OCx** series commands (refer to paragraph 7-10, "Calibration Coefficient Data Transfer").

NOTE

Use the **MK1?-MK6?** queries to output the marker frequency. Refer to Chapter 4, Data Analysis, for full details on Markers.

The **ORD** command - Output Raw Data, and the **OCD/ICD** commands — Output/Input Corrected Data — all transfer data in real and imaginary pairs (real value, imag value). Raw data is uncorrected measurement data from a sweep without a calibration applied. Corrected data is measurement data which has been corrected according to the currently applied calibration type.

When S-parameter data input to the 37XXX is complete (**ICD** and **IFD**) the 37XXX redraws the parameter on the active channel using this data.

NOTE:

Always place the 37XXX in hold (**HLD**) prior to inputting data using the **IFD** or **ICD** commands. This is to prevent the newly input data from being overwritten by subsequent sweeps.

Measurement Data Transfer Example

The following is an example usage of Measurement Data Transfer commands:

```
"NP101;CH2;MAG;TRS;WFS;HLD;FMC;LSB;OFD"
```

NP101 will set up a 101 point sweep. If a calibration is applied, this will only be allowed if the calibration was done with at least 101 points.

CH2 makes channel 2 the active channel for all subsequent channel specific commands.

MAG displays S-parameter data in Log Magnitude format on the active channel.

TRS triggers a new sweep.

WFS waits for a full sweep to ensure the data is valid. A full sweep is a complete forward sweep and a complete reverse sweep when a 12-term calibration is applied. It also includes time/distance data processing time if in time domain mode.

NOTES:

- You must wait for two full consecutive sweeps after first connecting a device, and prior to outputting data, when a 12-term calibration is applied, that is, "**WFS;WFS**".
- Set your controller's time out value high enough to allow the sweep to complete. Refer to Chapter 2 for more details.

HLD places the 37XXX in hold.

NOTE

Prior to being placed in HOLD, a channel must be displayed on the 37XXX — if calibration is not applied, and if you wish to output data from that channel.

FMC will output data using 32-bit (four bytes) floating-point format. The measurement data can be read directly into a floating point array dimensioned to 101 elements.

LSB causes data bytes to be output least significant byte first. This is for compatibility with INTEL/IBM based computer/controllers. If using other types of controllers that represent data in most significant byte format, then use the **MSB** command.

NOTE

It is good practice to always preface a data transfer command with the desired format command(s) every time it is used, that is, `"FMC;LSB;OFD"`, even if they were already set. This will help make your program more readable and easier to maintain and update in the future.

OFD uses the <Arbitrary Block> format. It will output 101 final measurement data values using the active channel's displayed graph units (dB). Each measurement value is represented using 4 bytes. The ASASCII header (#3404), which shows that 404 data bytes follow, precedes the measurement values. The linefeed character (0A, decimal 10) signals the end of the data block.
EXAMPLE:

```
#3404<f1, dB, 4 bytes> <f2, dB, 4 bytes>....
....<f101, dB value, 4 bytes>0A
```

NOTE:

The (< >) characters are not output from the 37XXXX. They are used in the text above to distinguish each 8 byte data segment.

The following shows the data stream if "**FMA;DPR0;OFD**" had been sent instead of "**FMC;LSB;OFD**". This produces the data in ASCII format. The **DPR0** is default mode, but it is sent anyway to insure previous data transfers did not change the setting. Note the header is now #41892, signifying that 1892 data bytes follow. EXAMPLE:

```
#418921.611913055E+01,5.22284173965E+01,..
....,4.74120521545E+010A.
```

The following response shows the data output if "**FMA;DPR1;OFD**" had been sent instead of "**FMC;LSB;OFD**". Note that inclusion of **DPR1** while in a single graph type display (**MAG**, magnitude in this case) will double the array size, by sending data pairs for each measurement point. Note also that the additional value is set to zero since the data for it was not measured. Refer to text above for complete details. Note the header is now #43731, signifying that 3731 data bytes follow. EXAMPLE:

```
#437311.611913055E+01,0.00000000000E+00,5.22284173965E+01,
0.00000000000E+00,.....,4.74120521545E+01,0.00000000000E+000A
```

7-12 ERROR REPORTING SYSTEM

The 37XXX implements a number of error reporting tools to assist you in detecting, reporting, and handling errors and other events in your application program. These tools will also prove invaluable to you during development of your application program. The tools are summarized below:

- Status Registers that you set to trigger an interrupt (or service request - SRQ) on many events such as GPIB errors, measurement data pass/fail testing, and end of calibration process. Refer to paragraph 7-15, "Status Reporting," for complete details.
- A time ordered Service Log that stores errors and other important system information in non-volatile memory. The Service Log can easily be accessed via GPIB and from the front panel.
- A GPIB error message structure that contains the last two GPIB errors encountered. This includes details on the program message element that caused the error.

Error Reporting Actions

The following summarizes the actions taken by the 37XXX when it detects an error:

An audible beep is issued to attract the operators attention.

An error message temporarily appears on the display.

An error message, with date and time and other details, is written in the Service Log (refer to paragraph 7-13 for details.) This

is *non-volatile* storage, meaning it will survive a power down of the 37XXX.

An error message string will also be saved internally in the GPIB software's Error Structures (refer to paragraph 7-12 for details.) This is *volatile* memory storage, meaning it will be lost when the 37XXX is powered down.

The appropriate bit in the Standard Events Status Register is set, and if enabled, a Service Request (SRQ) will be generated (refer to paragraph 7-15 for details.)

GPIB Error Messages

Refer to Chapter 13 for a complete list of 37XXX error messages and their descriptions.

37XXX errors reported in the Service Log include four errors which are detected by the internal GPIB Parser software during remote operation:

7204 GPIB Command Error

7205 GPIB Execution Error

7206 GPIB Device Specific Error

7207 GPIB Query Error

These errors are typically generated as a result of incorrectly programming the 37XXX. A detailed description of the errors and the data they provide in the Service Log and the GPIB Error Structures follows.

NOTE

Use the 37XXX error reporting mechanisms to effectively detect and handle error conditions, both during development and when preparing your finished application program .

Each of the GPIB errors will further provide a more precise sub-message of the specific condition that caused the error. Refer to Chapter 13, Table 13-3 for a complete list of these sub-messages and their descriptions.

"7204 GPIB Command Error"

These are errors in the syntactical correctness of a command, its numeric data entry element, or its data entry terminator code (or suffix mnemonic). As the internal GPIB command parser synchronization can be lost with this type of error, execution of the remainder of the program message is aborted.

If the command error was detected while executing a defined device trigger command sequence (refer to ***DDT** command, Chapter 10), execution of the remainder of the defined device trigger sequence will be aborted.

"7205 GPIB Execution Error"

These errors occur when a syntactically correct command fails to execute properly due to the command's parameters being out of range or not appropriate for the current instrument state.

"7206 GPIB Device Specific Error"

These errors occur when a command that is free of command and execution errors, fails to execute due to some unexpected instrument condition such as running out of memory.

"7207 GPIB Query Error"

These errors occur when the external controller attempts to read data from the 37XXX output buffer when either no data is available or data in the output buffer is lost.

7-13 SERVICE LOG

The 37XXX implements a non-volatile record of errors detected during front panel and GPIB operation in a Service Log. The log contains error messages along with the date and time and additional details about the error.

The Service Log can be viewed from the front panel Enhancement key group. Press the Option Menu key, then select DIAGNOSTICS and READ SERVICE LOG soft menus.

Refer to Chapter 8, "System Functions," for details on Service Log action commands such as printing, clearing, and saving it to disk.

Service Log Output Commands

Service Log data can be output via GPIB in two ways depending on the degree of detail desired about the errors. The commands listed in Table 7-11 will output all types of error messages. Refer to paragraph 7-12 for outputting *only* GPIB errors and their related details.

Table 7-11. *Error data transfer Commands*

OGE	Output extended description of latest GPIB error	None - Always ASCII
OGL	Output extended description of previous GPIB error	None - Always ASCII
ONE	Output number of error messages stored in Service Log	None - Always ASCII
OEL	Output list of error messages	None - Always ASCII
OSL	Output Service Log	None - Always ASCII

NOTE:
The Service Log error messages will remain stored, that is, they will not be deleted, when output via GPIB commands.

The **ONE** command - Output Number of Errors, can be used to periodically check if the 37XXX detected a new error without having to use

SRQ interrupts. The **OEL** command - Output Error List can then be used to output all the error messages in the Service Log. This is an ASCII text, comma separated list of all the error messages in the Service Log. The output is in <Arbitrary Block> format (refer to paragraph 7-3, Data Transfer Protocol Basics, for details.) In the example below, the list is preceded by the output header (#42960), the words ERROR LOG, the current date and time, then the error list.

EXAMPLE:

```
#42960ERROR LOG 01/23/95 19:18,
7205 GPIB EXECUTION ERROR, .....
```

The **OSL** command - Output Service Log, is used to output the complete contents of the Service Log. The output is in ASCII text format, so it can be saved directly to a file for later viewing and analysis. The Service Log output includes:

System identity information such as model, serial number, and software version

System statistics such as total operational hours, initial turn on date and time, and current date and time

List of all error messages with date and time of occurrence and other pertinent information.

The Service Log output will look similar to the Service Log as viewed from the front panel menus (Utility key, **DIAGNOSTICS, SERVICE LOG**, then **DISPLAY LOG** soft keys). The only difference is each line of text in the Log as output via **OSL**, will be comma separated from the other lines of text.

GPIB Error Entries Description

This paragraph describes details of Service Log GPIB error entries. Use this information to assist in application program development and to handle GPIB errors in your program.

There are two types of service log entries made in response to GPIB errors (errors 7204, 7205, 7206, 7207):

- The first type is 4 lines long and is made when a program message is currently being parsed and executed (the error can then be associated with a particular command within the message).
- The second type is only 3 lines long and is made when there is no currently active program message.

Service Log entries, description:

LINE 1:

The type of error, i.e.

7204 GPIB COMMAND ERROR

7205 GPIB EXECUTION ERROR

7206 GPIB DEVICE DEPENDENT ERROR

7207 GPIB QUERY ERROR

LINE 2:

The date and time of the error:

11/14/95 09:26

LINE 3:

For a 3 line service log entry

This line contains only a verbal description of the error:

No response data available

For a 4 line service log entry

The description is followed by an index number which is used to interpret line 4:

Faulty program mnemonic syntax, 13

LINE 4:

This line (approximately 47 characters long) will contain as much of the currently active program message as is possible. The index number from line 3 represents the position of the parser's command pointer when the error occurred. (1 is the first character).

For example, the program message below generated a command error when the parser reached the beginning of the faulty mnemonic CH5 (only **CH1-CH4** are valid). The parser index is placed at position 13 to indicate the the location of the faulty command referenced to the beginning of the line.

```
CH1;WFS;ASC;CH5;WFS;ASC
1           13
```

If the program message is longer than 47 characters, then, as much as possible of the message segment that contained the error will be displayed. The index number in line 3 will be adjusted automatically such that 1 always refers to the first displayed character.

If the error was detected while executing a defined device trigger command sequence (refer to ***DDT** command, Chapter 10), then line 4 will contain as much of the command sequence as possible.

If the error was detected while parsing and converting numeric fields within an <Arbitrary Block> program data element (refer to <Arbitrary Block> in paragraph 7-3), then line 4 will contain as much of the data as possible.

7-14 GPIB ERROR STRUCTURES

The 37XXX internal GPIB software task (Parser) maintains a list of the current and the previous GPIB errors that it generated. These two errors along with pertinent details can be output over the GPIB.

Refer to paragraph 7-13, Service Log, if you wish to output all 37XXX errors, including GPIB errors.

> ***NOTE:***
> Error messages will remain stored, that is, they will not be deleted, when output via the GPIB. Use the ***CLS** or **CSB** to clear the errors reported via the **OGE** and **OGL** commands.

The commands **OGE** - Output Current GPIB Error, and **OGL** - Output Previous GPIB Error (Table 7-6) , will output a message in <Arbitrary ASCII> data format (refer to paragraph 7-3 for details.) The data output will contain either 2 or 4 ASCII text fields separated with commas as follows:

<Error Type>,<Error Description>

or,

<Error Type>,<Error Description>,<Index Number>,
<Program Message>

The <Error Type> field will be one of the following:

Command Error

Device Error

Execution Error

Query Error

No errors

The <Error Description> field will contain the same message as reported in LINE 3 of the Service Log GPIB error entry.

The <Index Number> and <Program Message> fields are also included if there is a currently active program message which can be associated with the occurrence of the error. These fields will contain the Index Number and Program Message (refer to LINE 3 and LINE 4 of the Service Log GPIB Error Entry, paragraph 7-13.)

Error Reporting Data Output Example

The following is an example usage of Error Reporting Data Output commands:

```
"*TST?;ONE;OEL;OGE"
```

These commands will perform the following functions:

***TST?** will perform a self test and output the pass/fail status (0=pass, 1=fail). If any tests failed, the test number and error message will be written to the Service Log.

ONE will output the number of errors in the Service Log. The **OEL** will output the error message strings. **OSL** will output the complete Service Log text. If the **ONE** indicates there are errors in the Log, you could use the **OSL** command to output a complete copy of the Service Log to file on your computer for later investigation. This is especially useful during a long un-monitored test, where you may want to save all data for failure analysis.

Investigate any errors prior to proceeding with your application program task. If the error is critical, you should contact a qualified Service Person. Note that you can also output and view the Service Log from the front panel (refer to paragraph 7-13, Service Log.)

NOTE

Errors in the Service Log include certain user errors that may not be actual 37XXX system failures or errors.

For example, some DISK related errors may have been caused by a bad floppy or a floppy of the wrong media type.

Another example is RF POWER UNLEVELED and RF OVERLOAD errors (see Chapter 13), which are produced if the system reset power is exceeded to a point where the system becomes unleveled. This is normal behavior (the 37XXX allows you to set power above reset power to accommodate special needs (refer to **OID** command, Chapter 11, "Command Dictionary").

In fact, the **ONE**, **OEL**, **PWR**, and **P1P?** commands can be used together to check for these errors if you are attempting to find the maximum leveled power setting for a specific frequency range. Refer to Chapter 10, Command Dictionary for command details.

OGE (and **OGL**) can be used to output the GPIB error number, or "No errors" message, if none occurred. This is useful while debugging your application during development for displaying the error on your computer's screen for example. Note that by definition, these errors should not occur on a finished application program or they may be indicative of an error prone application.

7-15 STATUS REPORTING

The following paragraphs describe the 37XXX service request and status reporting model. The 37XXX model implements all mandated and many optional status reporting features specified by the IEEE 488.2 Standard. These include the Standard Event Status Register and two additional event status registers, Service Request Enable Register, and Parallel Poll Enable Register. The 37XXX implements full status and enable registers query capability. A diagram of the 37XXX Status Reporting Model is shown in Figure 7-3.

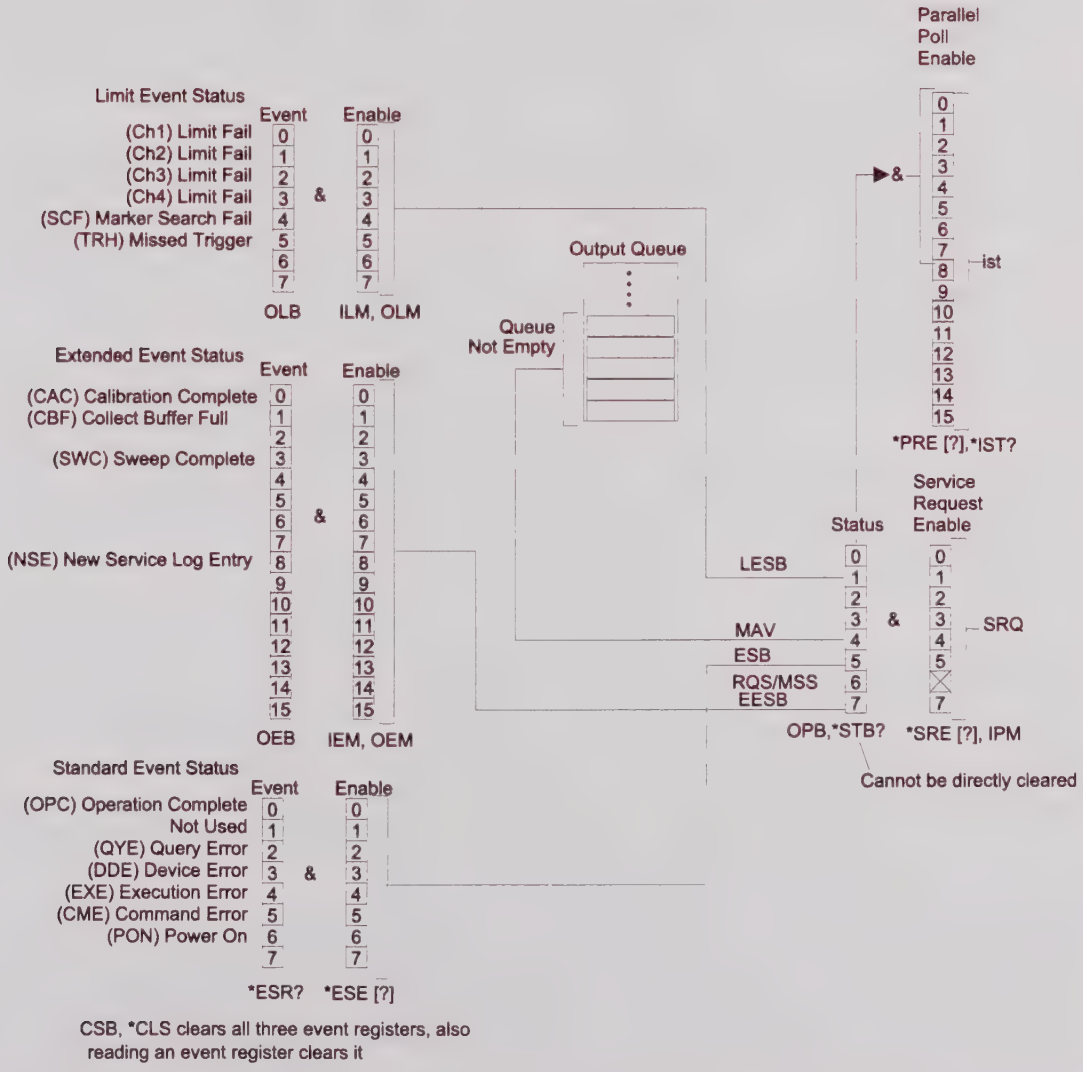

Figure 7-3. 37XXX Status Reporting Model

Event Status Registers

The 37XXXXA implements three *Event Status Registers* (ESRs). These are:

Standard Event Status Register (Standard ESR)

Extended Event Status Register (Extended ESR)

Limits Event Status Register (Limits ESR)

ESR bits always reflect the status of their specified 37XXXXA events (refer to paragraph 7-15, Status Events Description.) The registers are cleared (reset) when output by their respective query or output commands: ***ESR?** - Standard ESR Query, **OEB** - Output Extended ESR, **OLB** - Output Limits ESR. ESRs can also be cleared at any time via the Clear Status commands (***CLS** or **CSB**).

The overall summary status of each ESR (that is, whether or not any of its enabled events have occurred), is reported in the Status Byte Register.

Selecting Events for Status Reporting

The 37XXX *Event Status Enable Registers* (ESERs) allow you to select the specific event, or events, that you want summarized in the Status Byte Register.

The selection of a specific event, or events is done by enabling the desired event's bit. This is done by sending the appropriate ESER command with a binary weighted decimal value of the desired bit pattern.

The following commands are used to set and query ESER values:

***ESE**, ***ESE?** – used to set and query the value of the *Standard* ESER

IEM, **OEM** – used to input and output the value of the Extended ESER

ILM, **OLM** – used to input and output the value of the Limits ESER

Output Queue

The 37XXX Output Queue holds data which was requested by your application program. At any one time, the status of this queue is either empty (no data bytes available), or not-empty (at least one data byte is available.)

The Output Queue status is always reported in the 37XXX Status Byte Register. The Output Queue status bit is automatically set and cleared. The Output Queue is emptied when the last data byte it contains is output to the external controller or when the 37XXX detects a Query Error.

The Status Byte Register

The Status Byte Register is the summary status register of the overall 37XXX status. It can be directly queried for its value. It is also the ba-

sis for generating service requests, serial polling operations, and parallel polling operations. The Status Byte Register consists of a single 7-bit byte comprised of:

The Status Byte (bits 0-5, and bit 7), and

The MSS message or the RQS message (bit 6).

The Status Byte (bits 0-5, and bit 7) contains the overall status of the 37XXX. This includes the Output Queue status and the summary status of enabled bits in each event register. Once all enabled bits in an event register are cleared, or the Output Queue is emptied, the corresponding summary bit in the Status Byte Register will be reset.

The Master Summary Status (MSS) message is a single bit summary of the Status Byte (bits 0-5, and bit 7). This means bit 6 will be true if any of the other bits in the Status Byte Register are true, otherwise it will be false. The MSS message is sent in bit 6 when querying the status byte register and when generating the *IST message for parallel polling.*

The Requesting Service (RQS) message is true if the 37XXX has generated an SRQ, that is, it requested service. This message is reset automatically when the 37XXX is serial polled. The RQS message is sent in bit 6 if a serial poll is used to output the contents of the Status Byte Register.

Querying the Status Byte Register

The ****STB?*** – Status Byte Register Query, allows you to output the contents of the Status Byte Register without having to do a serial poll. When output in this manner, the Status Byte Register will contain the MSS message in bit 6 and the normal Status Byte in bits 0-5, and bit 7.

The ****STB?*** query will not change; that is, reset, the value of the Status Byte (bits 0-5, and bit 7) and the MSS message (bit 6).

Serial Polling the Status Byte Register

Serial Polling the 37XXX can also be used to output the contents of the Status Byte Register. The output will still contain the normal Status Byte in bits 0-5 and 7. The difference is this time the RQS message will be output in bit 6 instead of the MSS message.

It is important to note that serial polling will reset the RQS message in bit 6. This allows the 37XXX to again set the RQS bit true if it has a new reason for requesting service. The value of the Status Byte (bits 0-5, and bit 7) will not be reset or otherwise changed by a serial poll.

SRQ/Service Requests Generation

The 37XXX can be made to request service; that is. generate an SRQ interrupt, when any of the defined events occur. This is a two step process:

First, you need to enable the desired event (refer to Enabling Status Events)

Second, you need to enable the event's register bit in the Service Request Enable Register.

The ***SRE** and ***SRE?** commands are used to set and query the Service Request Enable Register. Sending "***SRE 0**" to the 37XXX will disable the 37XXX service request.

Parallel Polling the 37XXX

The Parallel Poll Enable Register is used to set the value of the 37XXX parallel poll status bit. This bit corresponds to the 37XXX individual status message (***ist***). The ist message can be output without a parallel poll operation using the *IST? query.

The *ist* message is set true when both of the following are true:

a bit is set true in the Status Byte Register, and,

the corresponding bit is enabled in the Parallel Poll Enable Register.

NOTE:
The MSS message is used in bit 6 of the Status Byte Register (refer to Status Byte Register above.)

The ***PRE** and ***PRE?** commands are used to set and query the Parallel Poll Enable Register. Sending "***PRE 0**" to the 37XXX will set the 37XXX ist message, and therefore the parallel poll status bit, to false, that is, 0.

Binary Weighted Decimal Values

All the enable commands or query commands described above for status reporting take or return a single argument. This is a binary weighted decimal value representing the sum of all the true (or set) bits in the register.

The binary weighted decimal value of a bit in a register is calculated by raising the number 2 to a power equal to the bit position.

For example, the binary weighted decimal value of bit 4 is arrived at by raising the number 2 to the 4^{th} power ($2^4 = 16$). Similarly, the decimal value of bit 0 is the number 2 raised to the 0 power ($2^0 = 1$).

The total decimal value of a register is the sum of the individual binary weighted decimal values of all enabled, or true bits. In the above example, this would be 16 + 1 = 17.

Status Reporting Commands Example

Following are example usages of Status Reporting commands:

EXAMPLE 1:

```
"*CLS;TRS;WFS;OEB"
```

These commands will perform the following functions:

***CLS** will clear all four event status registers.

TRS will trigger a new sweep.

WFS will set bit 4 (SWC) in the Extended Event Status Register when a full sweep is complete.

OEB will output the decimal value of the Extended Event Status Register. This will be the number 8 ($2^4 = 8$).

When a 12-term calibration is applied, a "full sweep" includes a complete forward sweep and a complete reverse sweep. It also includes time/distance data processing time if in time domain mode.

> Set your controller's time out value high enough to allow the sweep to complete. Refer to Chapter 2 for more details.

EXAMPLE 2:

```
"*CLS;IEM 8;*SRE 128;TRS;WFS"
```

These commands will perform the following functions:

***CLS** will clear all four event status registers.

IEM 8 will enable bit 4 (SWC) in the Extended Event Status Register (Extended ESR). This will set bit 7 (the summary status bit for the Extended ESR) in the Status Byte Register when the SWC bit gets set true.

***SRE 128** will cause the 37XXX to issue a service request (SRQ) when the enabled bit in the Extended Event Status Register gets set true.

TRS will trigger a new sweep.

WFS will set bit 4 (SWC) in the Extended Event Status Register when a full sweep is complete. Because of the **IEM** and ***SRE** that were issued, this will cause the 37XXX to issue a service request (SRQ).

7-16 STATUS EVENT DESCRIPTIONS

The following paragraphs describe the 37XXX status events functions. Refer to Figure 7-3, 37XXX Status Reporting Model (page 7-33) for the definition of bits in each of the three event registers described below. (Refer to paragraph 7-15, Status Reporting, for an operational description of the 37XXX reporting model.)

Standard Event Status Register

This register reports on the following events:

Bit 0:

The Operation Complete bit (OPC) is set true when all pending operations are completed after the ***OPC** command is issued. This is used

for synchronization of your application program with 37XXX operations.

Bit 1:

Not used.

Bit 2:

The Query Error bit (QYE) is set true when the 37XXX detects an error when attempting to execute an output or query command. Typically, this is due to requesting output when the Output Queue is empty or if the 37XXX emptied the queue due to an error situation.

The 37XXX will clear (empty) the Output Queue and issue a query error if it receives a program message while data requested by a previous command still remains in the Output Queue.

Bit 3:

The Device Specific Error bit (DDE) is set true when the 37XXX detects an error during execution of a valid 37XXX command and it is not able to complete its execution. An example of this is trying to access a bad floppy disk for read or write.

Bit 4:

The Execution Error bit (EXE) is set true when a valid command's argument is out of the 37XXX range or operational capabilities. This bit is also set when a valid command cannot be executed due to some 37XXX condition such as an option not installed or invalid state for the command.

Bit 5:

The Command Error bit (CME) is set true when the 37XXX Parser detects an invalid command. This is often generated due to unrecognized or invalid command syntax and incorrect use of separators and terminators.

Bit 6:

The User Request bit (URQ) is set true when a front panel key or control is invoked.

Bit 7:

The Power On bit (PON) is set true when the 37XXX is turned on.

Extended Event Status Register

This register reports on the following events:

Bit 0:

The Calibration Complete bit (CAC) is set true when all the steps of an Error Correction Calibration are complete after issuing the **BEG** or **RPC** commands.

Bits 1,2:

Not used.

Bit 3:

The Sweep Complete bit (SWC) is set true when a full sweep is completed after issuing the **WFS** command.

Bits 4-7:

Not used.

Bit 8:

The new service log entry bit (NSE) is set whenever a new error is entered in the service log. It can be used to detect lock failure and unleveled conditions.

Bits 9:

The Collect Buffer Full bit (CSF) is set when collecting data into a buffer (see paragraph 7-8) and the buffer becomes full.

Bits 10-15

Not used.

Limits Event Status Register

This register reports on the following events:

Bit 0:

The Channel 1 bit (CH1) is set true when a limit line has been exceeded on channel 1 after the **LT1** command has been issued.

Bit 1:

The Channel 2 bit (CH2) is set true when a limit line has been exceeded on channel 2 after the **LT1** command has been issued.

Bit 2:

The Channel 3 bit (CH3) is set true when a limit line has been exceeded on channel 3 after the **LT1** command has been issued.

Bit 3:

The Channel 4 bit (CH4) is set true when a limit line has been exceeded on channel 4 after the **LT1** command has been issued.

Bit 4:

The search failure bitr (SCF) is set TRUE when a marker search command (MKSL or MKSE) was issued but the target value was not found.

Bits 5:

The missed trigger bit (TRH) is set when either the TIB or TEB trigger mode is set and a Group Execute Trigger is received before the previous trigger event has completed. *The trigger is lost.*

Bits 6-7:

Not used.

Status Byte Register

This register reports on the following events:

Bit 0:

Not used.

Bit 1:

The Limits Event Status Bit (LESB) is set true if any of the enabled events in the Limits Event Status Register are true.

Bits 2, 3:

Not used.

Bit 4:

The Message Available bit (MAV) is set true if the Output Queue contains at least one byte of data. refer to related *OPC?, Operation Complete Query.

Bit 5:

The Standard Event Status Bit (ESB) is set true if any of the enabled events in the Standard Event Status Register are true.

Bit 6:

This bit contains either the Master Summary Status message (MSS) or the Request Service message (RQS), depending on how the Status Byte Register contents are output or used.

Refer to Status Byte Register description in paragraph 7-15.

Bit 7:

The Extended Event Status Bit (EESB) is set true if any of the enabled events in the Extended Event Status Register are true.

7-17 IEEE 488.2 COMMON COMMANDS

The IEEE 488.2 GPIB Standard specifies a common set of commands to support many standard instrument operations. The mandated and optional common commands implemented in the 37XXX are shown in Table 7-12 below.

These commands are fully described in Chapter 11, Command Dictionary. Further, the commands for status reporting are also described in paragraphs 7-15 and 7-16.

Table 7-12. *IEEE 488.2 Commands*

Command	Description
*CLSF	Clear status bytes and structures
*DDT	Enter the 488.2 Define Device Trigger command string
*DDT?	Output the 488.2 Define Device Trigger command string
*ESE	Enter the 488.2 Standard Event Status Enable mask
*ESE?	Output the 488.2 Standard Event Status Enable mask
*ESR?	Output the 488.2 Standard Event Status Register value
*IDN?	Output the 488.2 instrument identification string
*IST?	Output the value of the ist message
*OPC	Initiate the 488.2 Operation Complete sequence
*OPC?	Initiate the 488.2 Operation Complete Query sequence
*PRE	Enter the 488.2 Parallel Poll Register Enable mask
*PRE?	Output the 488.2 Parallel Poll Register Enable mask
*RST	Instrument reset
*SRE	Enter the 488.2 Service Request Enable mask
*SRE?	Output the 488.2 Service Request Enable mask
*STB?	Output the 488.2 Status Byte value
*TRG	Initiate a Group Execute Trigger sequence
*TST?	Perform self test and output status
*WAI	Wait to continue
OPB	Output the 488.2 Status Byte value (same as *STB?)
TST	Perform self test and output status (same as *TST?)

7-18 SYNCHRONIZATION COMMANDS

The 37XXX operation can be synchronized with your application program operations using the commands listed in Table 7-13 below. These commands are from various functional groups in the 37XXX GPIB command set. Refer to the appropriate references listed in the table and to Chapter 11, "Command Dictionary," for more details.

These commands are helpful in many operations related to outputting data, waiting for the sweep and the display to be updated, and many others. Where applicable, these commands are referenced and shown used in examples throughout the Programming Manual.

Table 7-13. 37XXX Synchronization Operations Commands

Command	Brief Description	References
WFS	Wait for full sweep	Chapter 5, Table 5-4
*OPC	Operation complete status	Paragraphs 7-13, 7-14
*OPC?	Operation complete query	Paragraphs 7-13, 7-14
TRS	Trigger sweep	Chapter 5, Table 5-4
HLD	Hold Measurement Process	Chapter 5, Table 5-4
SWPDIR?	Output Current Sweep (Phase Lock) direction	Chapter 5, Table 5-4
CTN	Continue sweeping (from HOLD state)	Chapter 5, Table 5-4

7-19 MISCELLANEOUS DATA TRANSFER COMMANDS

The 37XXX Miscellaneous Data Transfer Commands are listed in Table 7-14, below. The System Setups Commands are listed in Table 7-15.

Table 7-14. 37XXX Miscellaneous Data Transfer Commands

Command	Brief Description	Allowable Data Formatting
DIR	Output a disk subdirectory list	None - Always ASCII
IHDW	Enter hardware calibration data from GPIB	None - Always ASCII
IKIT	Enter calibration kit data from GPIB	None - Always ASCII
INRM	Enter trace memory data from GPIB	None - Always ASCII
OHDW	Output hardare calibration data to GPIB	None - Always ASCII
ONRM	Output trace memory data to GPIB	None - Always ASCII

Table 7-15. *37XXX System State Commands*

Command	Brief Description	Allowable Data Formatting
ICF	Input information for current front panel setup *and* calibration	None - Always Binary
IFP	Input information for current front panel setup	None - Always Binary
IS1 – IS10	Input information for stored front panel setup 1-10	None - Always Binary
OCF	Output front panel setup *and* calibration string	None - Always Binary
OFP	Output current front panel setup string	None - Always Binary
OS1–OS10	Ouput stored front panel setup string 1–10	None - Always Binary

Chapter 8
System Functions

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Chapter 8
System Functions

8-1 INTRODUCTION

This chapter describes the commands used to implement certain system functions. They consist of hard copy commands, system state commands, save/recall commands, disk function commands, and diagnostics commands. For certain functions, tables of commands are identified as being obsolete. This means they are no longer favored for new development. They were written for earlier product versions of the 37XXX VNA. They still remain to provide backward compatability, and should not be used when developing new program code.

8-2 RELATED COMMANDS

Table 8-1 provides a list of commands related to those used for system diagnostics. Refer to Chapter 8, paragraphs 8-9 through 8-11 for further information.

Table 8-1. *Related Commands*

Command	Description
OGE	Outputs extended description of current GPIB error.
OGL	Outputs extended description of previous GPIB error.
OEL	Outputs error messages from Service Log.
ONE	Output number of error messages stored in service log.
OSL	Output service log.

8-3 HARD COPY COMMANDS

The commands concerned with hard copy output are listed in Table 8-2; obsolete Hard Copy commands are listed in Table 8-3. These commands are straightforward with the exception of commands PT0–PT9. The PT0 – PT9 commands are used to:

- Specify the density of tabular data points output to the printer when using the PTB and PMT commands, and
- Specify the number of data points included in the disk file created with the SAVE command for tabular data.

The value implicit in the PT0 – PT9 commands (0 – 9) specifies the number of points that are *skipped* during printing. Therefore, PT0 selects the *densest* printing mode while PT9 gives the *fewest* number of data points. The HD0 command disables headers and page formatting for tabular printouts. The HD1 command enables headers and page formatting.

The hard copy output commands consist of two categories: *action* and *setup:*

- *Action* commands actually initiate a print/plot for the subset of the display specified by the setup commands.
- *Setup* commands are those that specify the desired size and location of the print/plot and the pen numbers for each element of the plot.

The LOC, LMS, LID, and LNM commands require a string of characters to be sent over the GPIB along with the command. A string input to the 37XXX *must* have the double quote characters (" ") or single quote characters (') surrounding the desired input.

The SAVE and RECALL commands enable the user to store tabular data to the disk and recall it for output to the printer with the tabular printout points controlled by commands PT0 – PT9. Other types of hard copy data can also be saved, but not recalled.

Text format hard copy data is formatted for *Microsoft Excel**. Before a user defined logo can be printed, the data file for that logo must exist on the hard drive in the "UTIL" subdirectory. See paragraph 10-6 for the data file names. These files can be created by the ANRITSU 37XXX LOGO editor, a Windows* based program for your PC.

Bitmapped hard copy data is formatted as a Windows 3.0 (and later) Device Independent Bitmap. The size is 640 by 480, and if color bitmap is selected, it is in a 256-bit color format. The user can select either black on white, color on white, or true color for the bitmaps.

HPGL format hard copy data is the file of HPGL commands and data normally sent to a plotter connected to the dedicated GPIB port. Microsoft Word has the capability to load and print this file type. It may also be sent to a GPIB plotter.

* Windows and Excel are both trademarks of Microsoft Corp.

Table 8-2. Hard Copy Commands (1 of 2)

Command	Description
BMPB	Select Black on White as bitmap type
BMPC	Select Color on White as bitmap type
BMPT	Select true color as bitmap type
DPN	Enter pen number for data
FFD	Send form feed to printer and stop print/plot
GPN	Enter pen number for graticule
HD0	Turn off tabular data headers and page formatting
HD1	Turn on tabular data headers and page formatting
HPN	Enter pen number for header
LAND	Select landscape mode for output plot
LDT0	Disable printing date/time
LDT1	Enable printing date/time
LMS	Enter string for DUT model/serial number
LOC	Enter string for operator comment
LOC?	Output string for operator comment
LOGO0	Turn hard copy logo off
LOGO1	Turn hard copy logo on
LOGO?	Output hard copy logo selection standard/user defined
LOGOS	Select standard hard copy logo
LOGOU	Select user defined hard copy logo
LOGOX?	Output hard copy logo on/off status
OBMP	Output the display as a bitmap
ODAT	Output hard copy tabular data to GPIB
OGCTXT	Output text format gain compression data to GPIB
OHDR	Output hard copy header information to GPIB
OHGL	Output HPGL format data to GPIB
OS2P	Output S2P format data to GPIB
OTXT	Output text format data to GPIB
PBL	Select 1/4 size plot bottom left corner
PBR	Select 1/4 size plot bottom right corner
PFL	Select full-size plot
PFS	Print full screen image
PGR	Print graph area screen image
PLD	Plot data area only
PLH	Plot header
PLM	Plot markers and limits
PLO?	Output plot mode portrait or landscape
PLS	Plot entire screen

Table 8-2. Hard Copy Commands (2 of 2)

Command	Description
PLT	Plot data traces only
PMK	Print tabular data for Markers
PMN	Plot menu
PMT	Print tabular data for traces and markers
PORT	Select portrait mode for output plot
PST	Stop print/plot
PT0	Set tabular printout points skipped to 0
PT1	Set tabular printout points skipped to 1
PT2	Set tabular printout points skipped to 2
PT3	Set tabular printout points skipped to 3
PT4	Set tabular printout points skipped to 4
PT5	Set tabular printout points skipped to 5
PT6	Set tabular printout points skipped to 6
PT7	Set tabular printout points skipped to 7
PT8	Set tabular printout points skipped to 8
PT9	Set tabular printout points skipped to 9
PTB	Print tabular data for Traces
PTL	Select 1/4 size plot top left corner
PTR	Select 1/4 size plot top right corner
SPD	Enter pen speed percentage
TPN	Enter pen number for trace overlay data

Table 8-3. Obsolete Hard Copy Commands

Command	Description
BBMP	Select black background for bit map
LDT	Enter string for test date/time (obsolete)
LDT?	Output string for test date/time (obsolete)
LIST	Output list of all mnemonics
OBMB	Output display as black and white bit map
OBMC	Output display as color bit map
WBMP	Select white background for bit map

8-4 SYSTEM STATE COMMANDS

Tables 8-4 lists the system state commands; obsolete commands are listed in Table 8-5. These commands are used to specify CRT display parameters, information display format, and other parameters that control the operation of the system. The function of approximately half of these commands is to display test set connector type information on the system screen. Table 8-4 list obsolete commands that remain for backward compatibality.

Table 8-4. System State Commands (1 of 3)

Command	Description
ANNCOL	Enter the color number for annotation and menu text
ANNCOL?	Output the color number for annotation and menu text
BC0	Turn CRT display off (disabled)
BC1	Turn CRT display on (disabled)
BCKCOL	Enter the color number for background
BCKCOL?	Output the color number for background
BCX?	Output CRT display on/off status
BEEP0	Disable the instrument beeper on GPIB errors
BEEP1	Enable the instrument beeper on GPIB errors
BEEPX?	Output GPIB beep on error enable/disable status
DATCOL	Enter the color number for data
DATCOL?	Output the color number for data
DATE	Enter the system date
DATE?	Output the system date
DC1	Display channel 1 and 2 operating parameters
DC3	Display channel 3 and 4 operating parameters
DCP	Display calibration parameters 1st page
DCP1	Display calibration parameters 1st page
DCP2	Display calibration parameters 2nd page
DD0	Turn data drawing off
DD1	Turn data drawing on

Table 8-4. System State Commands (2 of 3)

Command	Description
DD1?	Output data drawing on/off status
DF2	Display 2.4mm female connector information
DF3	Display GPC-3.5 female connector information
DFK	Display K female connector information
DFN	Display N female connector information
DFN75	Display N Female 75-Ohm connector information
DFP	Display Front panel instrument state
DFS	Display SMA female connector information
DFSP	Display Special Female connector information
DFT	Display TNC female connector information
DFV	Display V female connector information
DG7	Display GPC-7 Male connector information
DGS	Display GPIB status information
DM2	Display 2.4mm male connector information
DM3	Display GPC-3.5 male connector information
DMK	Display K male connector information
DMN	Display N male connector information
DMN75	Display N Male 75-Ohm connector information
DMS	Display SMA male connector information
DMSP	Display Special Male connector information
DMT	Display TNC male connector information
DMV	Display V male connector information
DWG	Display waveguide parameters
FOF	Blank frequency information
FON	Display frequency information
FOX?	Output frequency information on/off status
GRTCOL	Enter the color number for the graticule
GRTCOL?	Output the color number for the graticule
LAYCOL	Enter the color number for overlay data
LAYCOL?	Output the color number for overlay data
MKRCOL	Enter the color number for the markers
MKRCOL?	Output the color number for the markers
MNUCOL	Enter the color number for the menu headers
MNUCOL?	Output the color number for the menu headers
RST	Instrument reset (same as *RST)
RST0	Reset instrument front panel memories and reserved parameters
RST1	Reset instrument and front panel memories
RSTCOL	Reset color configuration to default

Table 8-4. *System State Commands (3 of 3)*

Command	Description
RTL	Return to local
TIME	Enter the system time
TIME?	Output the system time
TRCCOL	Enter the color number for memory data
TRCCOL?	Output the color number for memory data
WIDE	Use entire display width for graphs

Table 8-5. *Obsolete System State Commands*

Command	Description
BLU	Select blue as third plane color
CYN	Select cyan as third plane color

8-5 SAVE/RECALL COMMANDS

The Save/Recall commands listed in Table 8-6 allow the system user to save and recall the following:

- Front panel setup data to and from internal memory.
- Calibration and front panel setup data to/from the disk.

Table 8-6. Front Panel Memory Save/Recall Commands (1 of 1)

Command	Description
RC1	Recall front panel setup number 1 from memory
RC10	Recall front panel setup number 10 from memory
RC2	Recall front panel setup number 2 from memory
RC3	Recall front panel setup number 3 from memory
RC4	Recall front panel setup number 4 from memory
RC5	Recall front panel setup number 5 from memory
RC6	Recall front panel setup number 6 from memory
RC7	Recall front panel setup number 7 from memory
RC8	Recall front panel setup number 8 from memory
RC9	Recall front panel setup number 9 from memory
SV1	Save front panel setup number 1 to memory
SV10	Save front panel setup number 10 to memory
SV2	Save front panel setup number 2 to memory
SV3	Save front panel setup number 3 to memory
SV4	Save front panel setup number 4 to memory
SV5	Save front panel setup number 5 to memory
SV6	Save front panel setup number 6 to memory
SV7	Save front panel setup number 7 to memory
SV8	Save front panel setup number 8 to memory
SV9	Save front panel setup number 9 to memory

8-6 DISK FUNCTION COMMANDS

The Disk Function commands perform the same functions as the Hard Copy key group Menu key selections. These commands are listed in Tables 8-7. They are used for the following:

- Copying files between disks
- Deleting files from disk
- Saving files to a disk
- Recalling files from a disk
- Creating, changing to and deleting disk directories
- Outputting files to the GPIB
- Inputting files from the GPIB
- Loading cal kit files
- Formatting a floppy disk
- Outputting a disk directory listing to the GPIB

Table 8-7. *Disk Function Commands (1 of 1)*

Command	Description
ADRIVE	Select the floppy drive as the default drive
CD	Change default directory
CDRIVE	Select the hard disk as the default drive
COPY	Copy a files contents to another file
CWD?	Output current working directory string
DEL	Delete a file from disk
DIR	Output a directory listing to the GPIB
DISKRD	Output disk file data to the GPIB
DISKWR	Write GPIB data to a disk file
EXISTD?	Output directory existence information
EXISTF?	Output file existence information
INT	Initialize (format) floppy disk
LDARF	Load adapter removal files from disk and calibrate
LKT	Load calibration kit information from floppy disk
MD	Create a new disk directory
PDR	Print directory listing of the floppy drive
PDRH	Print directory listing of the hard drive
PGT	Plot graticule
RD	Remove a disk directory
RECALL	Recall a data file from disk to a task
SAVE	Save a data file to disk
SAVEGC	Save text format gain compression data to disk

- Printing a disk directory listing

Most of the file handling commands require a filename as an argument. The filename needs to be enclosed in quotes and listed complete with extention. You may include a path before the filename that may include a drive letter. If a path is not included, the file will be assumed to be in the current default drive and directory.

Drive Letters

Drive letters follow standard MS-DOS conventions:

- A:\for the floppy drive
- C:\ for the hard drive

Subdirectory Naming Conventions

Subdirectory naming conventions are as follows:

- Can have at most 11 characters
- The allowable characters are 1 thru 0, all letters, the period (.) and underscore (_)

File Naming Conventions

File naming conventions are as follows:

- The main portion of the filename can have at most 8 characters
- The extention portion of the filename can have at most 3 characters
- The filename must start with a letter
- The allowable characters are 1 thru 0, all letters and the underscore (_)

List of the Current 37XXXX File Types

A list of current filetypes is shown in Table 8-8.

Table 8-8. 37XXX File Types

Filename	File type
<user defined>.BMP	Screen dump in Windows bit map format (version 2.19)
<user defined>.CAL	Front panel and calibration data
<user defined>.DAT	Hard copy tabular data
<user defined>.ELG	Error log listing
<user defined>.HGL	Plotter dump in HPGL format
<user defined>.LOG	Service log listing
<user defined>.NRM	Trace memory data
<user defined>.S2P	Tabular data listing in S2P format
<user defined>.TXT	Tabular data listing in *Microsoft Excel* format
HW_CAL.ALC	ALC calibration data
HW_CAL.ALL	Contains all hardware calibration data elements
HW_CAL.FRE	Frequency calibration data
HW_CAL.LO1	1st LO calibration data
HW_CAL.LO2	2nd LO calibration data
HW_CAL.SLT	Source lock threshold calibration data
KIT_INFO.[xyz]	A data file for a connector type from a Cal Kit floppy disk Letter x 2 — 2.4 mm Connector 3 — GPC 3.5 Connector G —GPC 7 Connector K —K Connector N —N connector S — SMA Connector T — TNC connector V — V connector W — Waveguide Letter y A — Waveguide F — Female M — Male N — GPC 7 connector Letter z O — Open S — Short V — Waveguide
LOGO.EPS	User defined logo file for use on an Epson type printer
LOGO.HP	User defined logo file for use on an HP type printer
LOGO.PLT	User defined logo file for use on a plotter
MNEMONIC.HLP	GPIB mnemonic help file

Supported Commands for Backward Capability A listing of commands developed for previous versions of the software, but still supported, are listed in Table 8-9.

Table 8-9. *Obsolete Disk Functions Commands (1 of 3)*

Command	Description
CPYALCFH	Copy ALC cal file from floppy to hard disk
CPYALCHF	Copy ALC cal file from hard to floppy disk
CPYALLFH	Copy combined hardware cal file from floppy to hard disk
CPYALLHF	Copy combined hardware cal file from hard to floppy disk
CPYCALFH	Copy calibration/front panel setup from floppy to hard disk
CPYCALHF	Copy calibration/front panel setup from hard to floppy disk
CPYDATFH	Copy tabular data file from floppy to hard disk
CPYDATHF	Copy tabular data file from hard to floppy disk
CPYELGFH	Copy error list file from floppy to hard disk
CPYELGHF	Copy error list file from hard to floppy disk
CPYFREFH	Copy frequency cal file from floppy to hard disk
CPYFREHF	Copy frequency cal file from hard to floppy disk
CPYLOGFH	Copy service log file from floppy to hard disk
CPYLOGHF	Copy service log file from hard to floppy disk
CPYNRMFH	Copy trace memory file from floppy to hard disk
CPYNRMHF	Copy trace memory file from hard to floppy disk
DEC	Delete calibration/front panel setup from floppy disk
DECH	Delete calibration/front panel setup from hard disk
DED	Delete tabular data file from floppy disk
DEDH	Delete tabular data file from hard disk
DELALC	Delete ALC cal file from floppy disk
DELALCH	Delete ALC cal file from hard disk
DELALL	Delete combined hardware cal file from floppy disk
DELALLH	Delete combined hardware cal file from hard disk
DELCAL	Delete calibration/front panel setup from floppy disk
DELCALH	Delete calibration/front panel setup from hard disk
DELDAT	Delete tabular data file from floppy disk
DELDATH	Delete tabular data file from hard disk
DELELG	Delete error list file from floppy disk
DELELGH	Delete error list file from hard disk
DELFRE	Delete frequency cal file from floppy disk
DELFREH	Delete frequency cal file from hard disk
DELLOG	Delete service log file from floppy disk
DELLOGH	Delete service log file from hard disk
DELNRM	Delete trace memory file from floppy disk
DELNRMH	Delete trace memory file from hard disk

Table 8-9. Obsolete Disk Functions Commands (2 of 3)

Command	Description
DEN	Delete trace memory file from floppy disk
DENH	Delete trace memory file from hard disk
RCK	Recall trace memory file from floppy disk
RCKH	Recall trace memory file from hard disk
RCLALC	Recall ALC calibration file from floppy disk
RCLALCH	Recall ALC calibration file from hard disk
RCLALL	Recall combined hardware calibration file from floppy disk
RCLALLH	Recall combined hardware calibration file from hard disk
RCLCAL	Recall calibration/front panel setup from floppy disk
RCLCALH	Recall calibration/front panel setup from hard disk
RCLDAT	Recall tabular data file from floppy disk to printer
RCLDATH	Recall tabular data file from hard disk to printer
RCLELG	Recall error list file from floppy disk to printer
RCLELGH	Recall error list file from hard disk to printer
RCLFRE	Recall frequency calibration file from floppy disk
RCLFREH	Recall frequency calibration file from hard disk
RCLLOG	Recall service log file from floppy disk to printer
RCLLOGH	Recall service log file from hard disk to printer
RCLNRM	Recall trace memory file from floppy disk
RCLNRMH	Recall trace memory file from hard disk
RLD	Recall calibration/front panel setup from floppy disk
RLDH	Recall calibration/front panel setup from hard disk
RTB	Recall tabular data file from floppy disk to printer
RTBH	Recall tabular data file from hard disk to printer
SAVALC	Save ALC cal to floppy disk
SAVALCH	Save ALC cal to hard disk
SAVALL	Save combined hardware cal to floppy disk
SAVALLH	Save combined hardware cal to hard disk
SAVCAL	Save calibration/front panel setup to floppy disk
SAVCALH	Save calibration/front panel setup to hard disk
SAVDAT	Save tabular data to floppy disk
SAVDATH	Save tabular data to hard disk
SAVELG	Save error list to floppy disk
SAVELGH	Save error list to hard disk
SAVFRE	Save frequency cal to floppy disk
SAVFREH	Save frequency cal to hard disk
SAVLOG	Save service log to floppy disk
SAVLOGH	Save service log to hard disk
SAVNRM	Save trace memory to floppy disk

Table 8-9. Obsolete Disk Functions Commands (3 of 3)

Command	Description
SAVNRMH	Save trace memory to hard disk
SDK	Save trace memory to floppy disk
SDKH	Save trace memory to hard disk
STO	Save calibration/front panel setup to floppy disk
STOH	Save calibration/front panel setup to hard disk
TDD	Save tabular data to floppy disk
TDDH	Save tabular data to hard disk

8-7 DIAGNOSTICS COMMANDS

The commands listed in Table 8-10 are used to provide diagnostics help in localizing system malfunctions, performing calibration of internal circuits, testing system functions, and managing error reporting and the service log.

NOTE

The diagnostics commands in Table 8-10 are intended for use by only by ANRITSU certified service engineers.

Table 8-10. *Diagnostics Commands (1 of 2)*

Command	Description
ALC	Perform ALC loop internal calibration
DBP	Select distance bandpass mode for active channel
DCA	Select automatic DC term calculation for lowpass
DCO	Select open for DC term for lowpass
DLP	Select distance lowpass mode for active channel
DRL	Diagnostic read latch
DVM	Enter DVM channel number
DWL	Diagnostic write latch
EDG	End diagnostics mode
EXD	Display external A/D input
FLC	Source frequency linearity internal calibration
FPX?	Output flat power correction on/off status
IFB	Select 1st IF bandpass testing
LKS0	Disable lock search mode
LKS1	Enable lock search mode
LO11	Select LO1 phase lock voltage testing
LO12	Select LO1 D/A voltage testing
LO21	Select LO2 main phase lock voltage testing
LO22	Select LO2 offset phase lock voltage testing
LO23	Select LO2 DDS phase lock voltage testing
LO24	Select LO2 main D/A voltage testing
LO25	Select LO2 offset D/A voltage testing
NRD	Display non-ratioed parameters on 4 channels
PSL	Print the service log
SDG	Start diagnostics mode
SDR	Select standard receiver mode
SRC1	Select source linearity voltage testing

8-8 PERIPHERALS AND SELF TESTS

Peripheral tests used to support system diagnostics are listed in Table 8-11. All peripheral tests require user interaction and response to messages displayed on the 37XXXX screen and front panel displays.

Table 8-11. Peripheral Test Commands (1 of 1

Command	Description
DGT	Display 1st CRT test pattern
DGT1	Display 1st CRT test pattern
DGT2	Display 2nd CRT test pattern
DGT3	Display 3rd CRT test pattern
EKT	Select external keyboard testing
FPT	Select front panel keypad testing
PRT?	Perform printer test and output status

8-9 SERVICE LOG ACCESS COMMANDS

Commands used to access and control the Service Log functions via the GPIB are listed in Table 8-12.

Table 8-12. Service Log Commands (1 of 1)

Command	Description
*OPT?	Output the 488.2 options installed string
CSL	Clear service log
PEL	Print the error list
RECALL	Recall a data file from disk to a task
SAVE	Save a data file to disk

8-10 ADDRESSING

The commands used to address system peripherals are listed in Table 8-13.

Table 8-13. Addressing Commands

Command	Description
ADDFC	Enter frequency counter GPIB address
ADDFC?	Output frequency counter GPIB address
ADDPLT	Enter plotter GPIB address
ADDPLT?	Output plotter GPIB address
ADDPM	Enter power meter GPIB address
ADDPM?	Output power meter GPIB address
SRC1ADD?	Output external source 1 GPIB address

Chapter 9
Special Applications Functions

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Chapter 9
Special Applications Functions

9-1 INTRODUCTION

This chapter describes commands used to implement special measurement functions. They are associated with the functions controlled by the Domain key in the Measurement key group and the Option Menu key in the Enhancement key group. These include time domain commands, multiple source control commands, and rear panel output control commands.

NOTE

Flowcharts showing the 37XXX front panel keys and associated menu sequencing are provided in Appendix B. (Not included in this preliminary manual.)

9-2 TIME DOMAIN COMMANDS

The time domain commands for the 37XXX are listed below in Table 9-1. Option 2 (High-Speed Time Domain [Distance] Software option) adds these commands to the 37XXX software.

The time domain commands are used to:

- Specify the domain of a channel.
- Set up operating modes and parameters for the selected processing type of the channel.

Table 9-1. *Time Domain Commands (1 of 3)*

Command	Description
DCS	Select short for DC term for lowpass
DCV	Enter value for DC term for lowpass
DCV?	Output lowpass DC term value
DCX?	Output lowpass DC term selection
DCZ	Select line impedance for DC term for lowpass
DDX?	Output active channel domain parameter frequency distance or time
DPI	Select distance phasor impulse mode for active channel
FGT	Select frequency with time gate for active channel
FQD	Select frequency domain for active channel
GCT	Enter gate center value distance or time
GCT?	Output gate center value

Table 9-1. Time Domain Commands (2 of 3)

Command	Description
GDS	Gate symbols displayed on active channel
GLS	Select low sidelobe gate shape
GMS	Select minimum sidelobe gate shape
GNM	Select nominal gate shape
GOF	Turn off gating on active channel
GOF?	Output gating mode on active channel
GON	Turn on gating on active channel
GRT	Select Rectangular gate shape
GSN	Enter gate span value distance or time
GSN?	Output gate span value
GSP	Enter gate stop value distance or time
GSP?	Output gate stop value
GST	Enter gate start value distance or time
GST?	Output gate start value
GSX?	Output gate shape
LPI	Select lowpass impulse response for active channel
LPS	Select lowpass step response for active channel
LPSX?	Output lowpass response for active channel impulse or step
MRR	Restore original marker range
TBP	Select time bandpass mode for active channel
TDDIST	Set time domain parameter to distance for active channel
TDDIST?	Output active channel time domain parameter distance or time
TDPI0	Turn phasor impulse response off for active channel
TDPI1	Turn phasor impulse response on for active channel
TDPIX?	Output phasor impulse on/off status for active channel
TDTIME	Set time domain parameter to time for active channel
TDX?	Output domain mode for active channel
TLP	Select time lowpass mode for active channel
TPI	Select time phasor impulse mode for active channel
WLS	Select low sidelobe window shape
WMS	Select minimum sidelobe window shape
WNM	Select nominal window shape

Table 9-1. Time Domain Commands (3 of 3)

Command	Description
WRT	Select rectangular window shape
WSX?	Output window shape
ZCT	Enter zoom range center value time or distance
ZCT?	Output zoom range center value
ZSN	Enter zoom range span value time or distance
ZSN?	Output zoom range span value
ZSP	Enter zoom range stop value time or distance
ZSP?	Output zoom range stop value
ZST	Enter zoom range start value time or distance
ZST?	Output zoom range start value

9-3 MULTIPLE SOURCE CONTROL COMMANDS

Table 9-2 lists the multiple source control commands. These commands are used to define up to five different "multiple source control bands". In each, the device under test (DUT), source 1, source 2, and receiver frequency ranges may be different.

The DUT frequency range is entered using any of the frequency entry commands. The MSD command puts the 37XXX in the DEFINE mode, which allows entry of arbitrary frequencies for the DUT. Band equations for source 1, source 2, and the receiver are then set up using the ED1, ED2, EDR, etc, commands. The band equations used are shown below. In these equations, "F" is the DUT frequency range.

For swept operation:

F = *(multiplier / divisor) * (F + offset),*

For CW operation:

F = *(multiplier / divisor) * (offset).*

For a frequency band to be saved, the band equations must produce frequencies within the operating range of the respective system component.

Figure 9-1 shows an example program using multiple source control commands. This program is for a fixed LO, swept IF mixer measurement. The frequency values used are:

DUT range = 2 – 6 GHz
Source 1 = 2 – 6 GHz = (1/1) X (F + 0)
Source 2 = 500 MHz CW = (1/1) X (500 MHz)
Receiver = 1.5 – 5.5 GHz = (1/1) X (F – 500 MHz)

```
10 ! Multiple Source Control Example
20 OUTPUT 706; "MSD; SRT 2 GHZ; STP 6 GHZ"
30 OUTPUT 706; "BD1; BSP 6 GHZ"
40 OUTPUT 706; "ED1; ESW; EML 1 XX1"
50 OUTPUT 706; "EDV 1 XX1; EOS 0 GHZ"
60 OUTPUT 706; "ED2; ECW; EOS 500 MHZ"
70 OUTPUT 706; "EDR; ESW; EML 1 XX1"
80 OUTPUT 706; "EDV 1 XX1; EOS -500 MHZ"
90 OUTPUT 706; "SVB; MS1"
100 END
```

Figure 9-1. *Multiple Source Control Example*

Table 9-2. Multiple Source Control Commands (1 of 2)

Command	Description
BD1	Select band 1 for definition
BD2	Select band 2 for definition
BD3	Select band 3 for definition
BD4	Select band 4 for definition
BD5	Select band 5 for definition
BSP	Enter band stop frequency
BSP?	Output band stop frequency
BST	Enter band start frequency
BST?	Output band start frequency
CLB	Clear all multiple source band definitions
ECW	Select CW operation for component being edited
ED1	Edit source 1 equation
ED2	Edit source 2 equation
EDR	Edit receiver equation
EDV	Enter divisor value for equation being edited
EDV?	Output divisor value for equation being edited
EML	Enter multiplier value for equation being edited
EML?	Output multiplier value for equation being edited
EOS	Enter offset frequency for equation being edited
EOS?	Output offset frequency for equation being edited
ESW	Select sweep operation for component being edited
EXW?	Output multiple source sweep flag for equation being edited
MS0	Turn multiple source mode off
MS1	Turn multiple source mode on
MSD	Select multiple source define mode
MSX?	Output multiple source mode on/off/define
SRC1?	Output external source 1 existence information
SRC1AC	Select source 1 as active
SRC1AC?	Output source 1 active/inactive status
SRC1ADD	Enter external source 1 GPIB address
SRC1EX	Select source 1 as external
SRC1EX?	Output source 1 external/internal status

Table 9-2. *Multiple Source Control Commands (2 of 2)*

Command	Description
SRC1G0	Turn source 1 GPIB control off
SRC1G1	Turn source 1 GPIB control on
SRC1GX?	Output source 1 GPIB control on/off status
SRC1MOD?	Output external source 1 model/version string
SRC1NA	Select source 1 as not active
SRC1NT	Select source 1 as internal
SRC2	Select source power voltage testing
SRC2AC	Select source 2 as active
SRC2AC?	Output source 2 active/inactive status
SRC2ADD	Enter external source 2 GPIB address
SRC2ADD?	Output external source 2 GPIB address
SRC2G0	Turn source 2 GPIB control off
SRC2G1	Turn source 2 GPIB control on
SRC2GX?	Output source 2 GPIB control on/off status
SRC2MOD?	Output external Source 2 model/version string
SRC2NA	Select source 2 as not active
SVB	Save current band definitions

9-4 REAR PANEL OUTPUT CONTROL COMMANDS

Table 9-3 lists the commands for controlling the rear-panel voltage output of the 37XXX. The RV1 command enables the output and command RV0 disables it. The orientation of the output can be set to either horizontal (RVH), vertical (RVV), lock direction (RVL), or DC value (RVD).

In the horizontal mode, the voltage output is a digital ramp starting at the voltage start value set by command VST and ending at the voltage stop value set by command VSP. The start value corresponds to the first point of the sweep and the stop value corresponds to last point of the sweep. In the vertical mode, the output voltage is a measure of the instantaneous data point value. The output voltage is related to the scaling of the graph for channel 1. The reference line corresponds to the zero volt value and each graticle line is equal to a ±1 volt value span. The values set by the VST and VSP commands have no effect in the vertical mode.

In the lock direction mode, the start voltage value is output for forward sweeps (lock to Ra). The stop voltage value is output for reverse sweeps (lock to Rb).

In the DC value mode, the rear panel output voltage is set to the DC value programmed with the RPO command.

Table 9-3. *Rear Panel Output Control Commands*

Command	Description
RPO	Enter rear panel dc voltage value
RPO?	Output rear panel dc voltage value
RV0	Turn rear panel output voltage off
RV1	Turn rear panel output voltage on
RV1?	Output rear panel output voltage on/off status
RVD	Set rear panel output mode to dc value
RVH	Set rear panel output mode to horizontal
RVL	Set rear panel output mode to lock direction
RVV	Set rear panel output mode to vertical
RVX?	Output rear panel output mode

9-5 RECEIVER MODE

The Receiver Mode commands (Table 9-4) allow the user to change the way the receiver functions.

Table 9-4. Receiver Mode Control Commands

Command	Description
SDR?	Output receiver mode
SL1	Select source lock mode
ST1	Select set on mode
TK1	Select tracking mode

9-6 USER DEFINED PARAMETERS

User defined parameters permit the user to substitute a different ratio for S parameters. The following commands (Table 9-5) are provided to accomplish this task.

Table 9-5. *User-Defined-Parameter Commands*

Command	Description
DA1	Select a1 = Ra as denominator for parameter being defined
DA2	Select a2 = Rb as denominator for parameter being defined
DB1	Select b1 = Ta as denominator for parameter being defined
DB2	Select b2 = Tb as denominator for parameter being defined
DE1	Select unity as denominator for parameter being defined
DEN?	Output denominator selection for parameter being defined
NA1	Select a1 as numerator for parameter being defined
NA2	Select a2 as numerator for parameter being defined
NB1	Select b1 as numerator for parameter being defined
NB2	Select b2 as numerator for parameter being defined
NU1	Select unity as numerator for parameter being defined
NUM?	Output numerator selection for parameter being defined
USL	Enter label string for user parameter being defined
USL?	Output label string for user parameter being defined
USR1	Measure user parameter 1 on active channel
USR2	Measure user parameter 2 on active channel
USR3	Measure user parameter 3 on active channel
USR4	Measure user parameter 4 on active channel

9-7 ADAPTER REMOVAL COMMANDS

The Adapter Removal commands(Table 9-6) let the user perform an adapter removal calibration. This application involves performing two very specialized 12 term corrections and saving them to disk or the GPIB to recall later. Before using these commands, become thoroughly familiar with the manual procedure and instructions.

Table 9-6. Adapter Removal Control Commands

Command	Description
ADPL	Enter electrical length for adapter removal
ADPL?	Output electrical length for adapter removal
IARF	Enter adapter removal files from GPIB and calibrate

9-8 GAIN COMPRESSION

The 37XXX uses two gain compression methods for amplifier testing: swept power and swept frequency. The gain compression commands are listed in Table 9-7.

Swept Power Gain Compression

The Swept Power Gain Compression Application lets users see the gain compression of an amplifier-under-test (AUT) at up to 10 continuous wave (CW) frequencies and sweeping power over a predefined range and stepsize.

The displays are in power out and normalized S21. Marker search is used to automatically find the gain compression point. There are actually two types of tests in this application. They are:

- *The swept power gain compression test.* In this test, the frequency is constant at one of the 10 CW frequencies programmed previously, and the power is swept over the power range. Users can change the frequency and observe the gain compression point at that frequency.

- *The multiple frequency swept power gain compression test.* This is an all encompassing test which automatically measures the gain compression at all of the preselected frequencies and graphs the results. It is the results of this test that are referred to by the commands OGCFD, OGCTXT and SAVEGC.

Before using these commands, become thoroughly familiar with the manual procedure and instructions.

This application makes use of the Discrete Fill command set to program the test frequencies. The commands will not be relisted here.

Several of the commands listed in Table 10-8 are also applicable to the Swept Frequency Gain Compression Application which is described in another section of this manual. They will be listed again in that section.

Swept Frequency Gain Compression

The Swept frequency gain compression application lets users see the gain compression of an amplifier-under-test (AUT) over the full operating frequency range by creating two calibrated displays. The top display shows power out and the bottom in normalized gain. While sweeping the frequency range the user may vary the input power and observe any change in gain on the bottom graph. The user should become thoroughly familiar with the manual procedure and instructions before attempting to control the application from the GPIB.

This application makes use of a Flat Test Port Power Calibration to achieve a higher degree of accuracy. The commands for this calibration are not re-listed here.

Table 9-7. Gain Compression Commands

Command	Description
CALR	Perform receiver cal for gain compression testing
GCMP	Enter gain compression point search value
GCMP?	Output gain compression point search value
MFGCT	Start multiple frequency swept power gain compression test
NOFST	Enter nominal offset value for external gain
NOFST?	Output nominal offset value for external gain
NRMS	Normalize S21 for gain compression testing
PSET	Enter target power for gain compression receiver cal
PSET?	Output target power for gain compression receiver cal
PSTEP	Enter power sweep step size
PSTEP?	Output power sweep step size
PSTOP	Enter power sweep stop power
PSTOP?	Output power sweep stop power
PSTRT	Enter power sweep start power
PSTRT?	Output power sweep start power
PSWC	Perform power sweep linearity calibration
PSWC0	Turn power sweep linearity calibration off
PSWC1	Turn power sweep linearity calibration on
PSWCX?	Output power sweep linearity calibration on/off status
PSWP0	Turn power sweep off
PSWP1	Turn power sweep on
PSWPX?	Output power sweep on/off status
RSTGC	Reset gain compression parameters to default
SFGCA	Select swept frequency gain compression application
SFGCT	Start swept frequency gain compression test
SPGCA	Select swept power gain compression application
SPGCT	Start swept power gain compression test
UNDOGC	Exit gain compression and undo changes

9-9 MILLIMETER WAVE OPERATION

The 3735A Millimeter Wave Test Set was designed to operate in conjunction with a varied selection of Millimeter Wave Heads, a 371XXA series VNA and two synthesizers. Taken together, these form a new entity for S-Parameter testing in the waveguide bands.

Once the Millimeter Wave mode is established via the mnemonic SELMM, it persists. That is, it is not cleared with a normal reset, and it is remembered when the instruments are powered off. The only way to terminate the Millimeter Wave mode is by selecting normal Internal Operation via the mnemonic SELINT, or by selecting the master reset RST0.

Millimeter Wave operation is by definition, a multiple source control mode of operation. The band and equation information is taken care of automatically by the VNA and requires no user intervention. The user, however, may change the band start and stop frequencies and equations, if desired. The table below shows the mnemonics which are provided for that end.

Notice there is only one band. This band is separate from the five bands that can be defined in the normal internal test set mode of operation. Therefore, it is selected and controlled via the new mnemonics BDMM, CLBMM and SVBMM. As Millimeter Wave is already an active multiple source control mode, SVBMM both saves and activates the new band equations. The normal multiple source mnemonics ECW, ESW, MS0, MS1, MSD, and BD1 through BD5 are not permitted. The commands that control this operational mode are listed in Table 9-8.

Table 9-8. Millimeter Wave Commands

Command	Description
BDMM	Define Millimeter Wave band equations
CLBMM	Clear the new Millimeter Wave band definitions
E12	Set Millimeter Wave band to E band (WR-12)
E12E	Set Millimeter Wave band to E band (WR-12)
MMBX?	Output Millimeter Wave band selection
P1MMN	Set Port 1 Millimeter Wave Head to None
P1MMR	Set Port 1 Millimeter Wave Head to Receiver (3741)
P1MMT	Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740)
P1MMX?	Output Port 1 Millimeter Wave Head type
P2MMN	Set Port 2 Millimeter Wave Head to none
P2MMR	Set Port 2 Millimeter Wave Head to Receiver (3741)
P2MMT	Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740)
P2MMX?	Output Port 2 Millimeter Wave Head type
Q22	Set Millimeter Wave Band to Q Band (WR-22)
SELINT	Select Internal (normal) test set operation
SELMM	Select Millimeter Wave test set operation
SELXX?	Output the test set selection MMWave/Internal
SVBMM	Save and activate the new Millimeter Wave band definitions
V15	Set Millimeter Wave Band to V Band (WR-15)
W10	Set Millimeter Wave Band to W Band (WR-10)
W10E	Set Millimeter Wave Band to extended W Band (WR-10E)

Part 3 Programming Reference

This part consists of three chapters that provide programming reference information for the 37XXX VNA.

***Chapter 10** – provides a list of all GPIB commands for the 37XXX. The listing for each command (mnemonic) includes relevant details about the command.*

***Chapter 11** – provides general (non-command specific) tabular information for the 37XXX. Much of this information is presented in Chapters 4 through 10, but is provided in this chapter for easy access.*

***Chapter 12** – provides a list of all Error Messages related to remote- only (GPIB) operation of the 37XXX.*

Chapter 10
Command Dictionary

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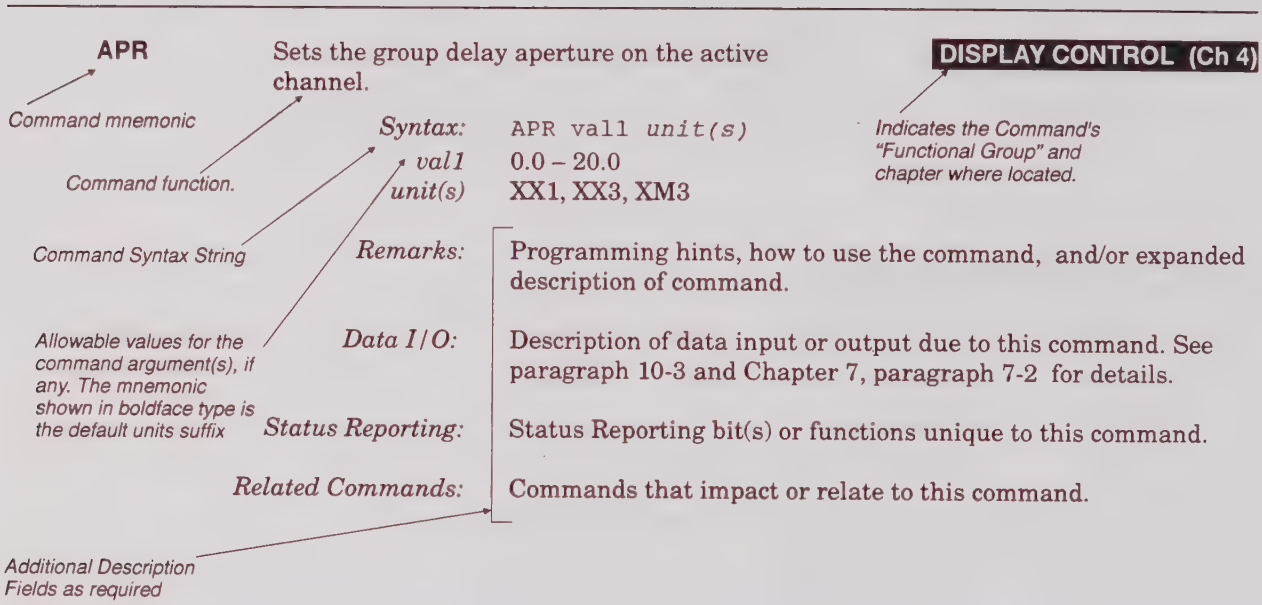
APR
Sets the group delay aperture on the active channel.
DISPLAY CONTROL (Ch 4)
Command mnemonic
Command function.
Syntax: APR val1 unit(s)
val1 0.0 – 20.0
unit(s) XX1, XX3, XM3
Indicates the Command's "Functional Group" and chapter where located.
Command Syntax String
Remarks: Programming hints, how to use the command, and/or expanded description of command.
Allowable values for the command argument(s), if any. The mnemonic shown in boldface type is the default units suffix
Data I/O: Description of data input or output due to this command. See paragraph 10-3 and Chapter 7, paragraph 7-2 for details.
Status Reporting: Status Reporting bit(s) or functions unique to this command.
Related Commands: Commands that impact or relate to this command.
Additional Description Fields as required

Figure 10-1. *Typographic Conventions for the Command Listings*

Chapter 10
Command Dictionary

10-1 INTRODUCTION

This chapter provides a listing of GPIB programming commands (mnemonics) used with the Model 37XXX Vector Network Analyzer.

10-2 TYPOGRAPHIC CONVENTIONS

The typographic conventions, abbreviations, and syntax legend used throughout this chapter to define the GPIB commands are described in Figure 10-1 (opposite page).

10-3 DATA I/O FORMATS AND TEMPLATES

The data input and output formats and templates, referred to throughout this chapter, are delimited with the less-than and greater-than characters (< >). These characters are not part of the data; they are only used in this text to distinguish the data elements they represent. See Chapter 7, Remote Only Operations, "Data Transfer" for complete details.

37XXX data formats are summarized below:

<NR1>
This notation represents ASCII integer values. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR1> notation:

1
0
-29,179

<NR2>
This notation represents ASCII floating point values in decimal point format. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR2> notation:

1.0
-0.00015
12.743,-180.07

<NR3>
This notation represents ASCII floating point values in exponential format (scientific notation). A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR3> notation:

1.0E9
7.056E3
9.0E2,3.42E2

<NRf>
This notation is used to signify that data can be in either <NR1>, <NR2>, or <NR3> format as described above.

Examples of values that can be represented by <NRf> notation:

1.0E9
10.005
83,4.5E2,234.9901

<String>
This notation represents a string of 7-bit ASCII characters (including nonprintable characters) that is delimited (surrounded) with either single quotes (' ') or double quotes (" "). The string can include text formatting characters such as linefeed, space, or carriage return.

Note that if a double quote character must be sent as part of the string, then it must be followed by an additional double quote. Alternatively, the string can be sent using single quotes (See "cal_file" example below.)

Examples of data represented by <String> notation:

"1/15/98"
"Save" "cal_file" "now."
'Save" "cal_file" now.'

<Arbitrary ASCII>
This notation represents undelimited 7-bit ASCII text. The end of the text must be terminated with the 0A character (decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI). This requirement makes it necessary for <Arbitrary ASCII> text to be transmitted only at the end of a program or response message, i.e. at the end of a multiple input or output statement.

Example of data represented by <Arbitrary ASCII> notation:

Wiltron,37247A,123456,1.0<0A^EOI>

The example shows a sample response from the *IDN?, 488.2 common query. In the example, the instrument identifies itself as a Wiltron 37247A, with serial number 123456, and software version 1.0 installed. Note that decimal 10 (0A character) must be sent with the EOI to signal end of transmission.

<Arbitrary Block>
This notation represents data that is transmitted as 8-bit data bytes (00-FF hex, 0-255 decimal, notation is <DAB>). This is useful for transmitting large blocks of formatted ASCII or binary data or unformatted binary data. The data stream is immediately preceded by a variable length ASCII header that is encoded with the number of data bytes to be sent. The header always starts with the pound (#) character. Figure 10-2 below describes the header and the transmitted data messages.

Where:

# = The pound sign character. Required for binary data transfer.
n = Number of digits to follow (m1..mn) that make up the number m.
$m_1..m_n$ = Taken together, this makes up the number m which is the number of data bytes to follow that constitute the requested data.
<DAB> = An 8-bit binary data byte. This is the data (or information) being sent.

NOTE

If n = 0, then m is omitted, and transmission end is signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End Of Transmission State (EOI) immediately following the last <DAB>.

Figure 10-2. *<Arbitrary Block> Data Format*

10-4 FUNCTIONAL GROUPS

Throughout this chapter, the distinctive, white on black text, in the upper corner of each command's description area, is the functional group to which the command belongs (see Figure 10-1, page 10-2). The 37XXX GPIB Function Groups are described in Chapters 4 through 9; they provide descriptive details and tabular data that apply to the group as a whole.

10-5 RELEVANT TABLES

Data referenced in many places within this chapter is located in Chapter 11, "Instrument Data."

10-6 COMMANDS

The remaining pages in this chapter provide an alphabetical listing of the commands (mnemonics) used to program the Model 37XXX Vector Network Analyzer.

***CLSF** Clear status bytes and structures **IEEE 488.2 (Ch 7)**

Syntax: `*CLS`

Status Reporting: Clears the Standard Event Status Register, the Extended Event Status Register, and the Limits Status Register. Also clears the Operation Complete Command and Query states by setting them to idle state, i.e. no operations pending. Also clears the GPIB error message buffers (see OGE, OGL).

***DDT** Enter the 488.2 Define Device Trigger command string **IEEE 488.2 (Ch 7)**

Syntax: `*DDT val1`
Val 1: Valid 37XXX GPIB command sequence in format

Remarks: Clears the Standard Event Status Register, the Extended Event Status Register, and the Limits Status Register. Also clears the Operation Complete Command and Query states by setting them to idle state, i.e. no operations pending. Also clears the GPIB error message buffers (see OGE, OGL).

Related Commands: *TRG

***DDT?** Output the 488.2 Define Device Trigger command string **IEEE 488.2 (Ch 7)**

Syntax: `*DDT?`

Data I/O: The query response is sent using the <Arbitrary Block> format (paragraph 10-3).

***ESE** Enter the 488.2 Standard Event Status Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*ESE val1`
Val 1: 0-255

Remarks: Sets the bits of the Standard Event Status Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0.

Data I/O: The value is input in ASCII <NRf> format (paragraph 10-3).

***ESE?** Output the 488.2 Standard Event Status Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*ESE?`

Remarks: Returns the decimal value of the bit pattern of the Standard Event Status Enable Register. The value is 0-255.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

***ESR?** Output the 488.2 Standard Event Status Register value **IEEE 488.2 (Ch 7)**

Syntax: `*ESR?`

Remarks: Returns the decimal value of the bit pattern of the Standard Event Status Register and clears it. The value is 0-255.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

***IDN?** Output the 488.2 instrument identification string **IEEE 488.2 (Ch 7)**

Syntax: `*IDN?`

Remarks: This query returns the 37XXX identification string. The string consists of four comma separated fields as follows: Anritsu, Model, Serial #, Software Revision.

The actual model number, serial number, and software revision of the 37XXX queried will be passed. The maximum length of the string is 72 characters.

Data I/O: Outputs the 488.2 instrument identification string using an <Arbitrary ASCII> format (paragraph 10-3).

Related Commands: OID, *OPT?

***IST?** Output the value of the ist message **IEEE 488.2 (Ch 7)**

Syntax: `*IST?`

Remarks: The *ist* is the status bit sent by the 37XXX in response to a parallel poll. The *IST? query outputs the value of the *ist* without having to perform a parallel poll. The output value is 1 if *ist* is TRUE, 0 if it is FALSE.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

Related Commands: *PRE, *PRE?

***OPC** Initiate the 488.2 Operation Complete sequence — **IEEE 488.2 (Ch 7)**

Syntax: `*OPC`

Status Reporting: Sets the Operation Complete bit 0 in the Standard Event Status Register after all pending operations are complete.

Related Commands: *OPC?

***OPC?** Initiate the 488.2 Operation Complete Query sequence — **IEEE 488.2 (Ch 7)**

Syntax: `*OPC?`

Remarks: Ouputs an ASCII "1" after all pending operations are complete.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

Related Commands: *OPC

***OPT?** Output the 488.2 options installed string — **SERVICE LOG (Ch 8)**

Syntax: `*OPT?`

Remarks: This query returns the installed, reportable 37XXX options identification string. The string consists of comma separated fields containing the option numbers or a 0 if none are installed. The maximum length of the string is 255 characters.

Data I/O: Outputs an <Arbitrary ASCII> format (paragraph 10-3)

Related Commands: OID, *IDN?

***PRE** Enter the 488.2 Parallel Poll Register Enable mask — **IEEE 488.2 (Ch 7)**

Syntax: `*PRE val1`
Val 1: 0 to 65535

Remarks: Sets the bits of the Parallel Poll Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0.

Data I/O: The value is input in ASCII <NRf> format (paragraph 10-3).

***PRE?** Output the 488.2 Parallel Poll Register Enable mask — **IEEE 488.2 (Ch 7)**

Syntax: `*PRE?`

Remarks: Returns the decimal value of the bit pattern of the Parallel Poll Enable Register.

Data I/O: Output the 488.2 Parallel Poll Register Enable mask using ASCII <NR1> format (paragraph 10-3).

Related Commands: *IST?

***RST** Instrument reset — **IEEE 488.2 (Ch 7)**

Syntax: `*RST`

Remarks: Resets the 37XXX to default state with all user programmable parameters set to their default values. Default state settings are listed in Chapter 12. This command does not affect the Output Queue, any Status or Parallel Poll Registers, or the 37XXX GPIB address setting.

Related Commands: RST, RST0, RST1

***SRE** Enter the 488.2 Service Request Enable mask — **IEEE 488.2 (Ch 7)**

Syntax: `*SRE val1`
Val 1: 0 to 55

Remarks: Sets the bits of the Service Request Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0. Note that the Master Summary Status (MSS) bit 6 (decimal 64) will be ignored since it represents the summary of all enabled status bits (bits 0-5, 7).

Data I/O: The value is input in ASCII <NRf> format (paragraph 10-3).

***SRE?** Output the 488.2 Service Request Enable mask — **IEEE 488.2 (Ch 7)**

Syntax: `*SRE?`

Remarks: Returns the decimal value of the bit pattern of the Service Request Enable Register. The value will be 0 to 63, or 128 to 191, with the MSS bit 6 (decimal 64) zeroed out (See *SRE).

Data I/O: Outputs the 488.2 Service Request Enable mask using ASCII <NR1> format (paragraph 10-3).

***STB?** Output the 488.2 Status Byte value **IEEE 488.2 (Ch 7)**

Syntax: `*STB?`

Remarks: Returns the decimal value of the bit pattern of the Status Byte and the Master Summary Status bit 6. The value will be 0 to 255.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

***TRG** Initiate a Group Execute Trigger sequence **IEEE 488.2 (Ch 7)**

Syntax: `*TRG`

Remarks: The previously defined trigger action using the *DDT command will be placed in the GPIB input buffer, parsed, and executed. This is the instrument specific equivalent of the 488.1 GET, Group Execute Trigger message.

Related Commands: *DDT, *DDT?

***TST?** Perform self test and output status **IEEE 488.2 (Ch 7)**

Syntax: `*TST?`

Remarks: Causes the 37XXX to perform an extensive, fully automated internal circuits self test. Detailed error messages indicating self test failures, if any, are placed in the service log in the order they occur. The query returns a 1 if any part of the self test failed, or a 0 when passed. NOTE: When commands TST or *TST? are sent to the 37XXX, the VNA output power is momentarily set to the model-dependent Rated Power level during the self test. Ensure that any equipment connected to Port 1 or Port 2 will not be damaged by this power level.

Data I/O: Returns a value in ASCII <NR1> format (paragraph 10-3).

Related Commands: ONE, OEL, OSL, PSL, TST

***WAI** Wait to continue **IEEE 488.2 (Ch 7)**

Syntax: `*WAI`

Remarks: Suspends the execution of any further commands or queries until all pending operations are completed. Note that this command is required by the 488.2 Standard but has no effect on 37XXX operation. The 37XXX executes all commands sequentially, i.e. it will always wait for commands and queries to finish executing prior to processing new commands.

Related Commands: *OPC, *OPC?

A12 Simulate 12-term calibration **CALIBRATION (Ch 5)**

Syntax: `A12`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC12, ICL, CON. Also see C12, OC1-OC12, OCL

A8R Simulate 1-path 2-port calibration reverse path **CALIBRATION (Ch 5)**

Syntax: `A8R`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC5, CON. Also see C8R, OC1-OC5

A8T Simulate 1-path 2-port calibration forward path **CALIBRATION (Ch 5)**

Syntax: `A8T`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC5, CON. Also see C8R, OC1-OC5

ABT Simulate trans freq response calibration forward and reverse — **CALIBRATION (Ch 5)**

Syntax: `ABT`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC2, CON. Also see CBT, OC1-OC2

ADD Select addition as trace math for active channel — **DISPLAY (Ch 4)**

Syntax: `ADD`

Remarks: Store trace data to memory. Issue this command then normalize the trace to display the complex addition result of measured data and memory data.

Related Commands: CH1-CH4, STD, DNM

ADDFC Enter frequency counter GPIB address — **ADDRESSING (Ch 8)**

Syntax: `ADDFC val1`
Val 1: 1-30
Units: XX1

Data I/O: The value is input in ASCII <NRf> format (paragraph 10-3)

Related Commands: ADDFC?,ADDPLT,ADDPM,SRC1ADD,SRC2ADD

ADDFC? Output frequency counter GPIB address — **ADDRESSING (Ch 8)**

Syntax: `ADDFC?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3)

Related Commands: ADDFC,ADDPLT?,ADDPM?,SRC1ADD?,SRC2ADD?

ADDPLT Enter plotter GPIB address — **ADDRESSING (Ch 8)**

Syntax: `ADDPLT val1`
Val 1: 1-30
Units: XX1

Data I/O: The value is input in ASCII <NRf> format (paragraph 10-3)

Related Commands: ADDPLT?,ADDFC,ADDPM,SRC1ADD,SRC2ADD

ADDPLT? Output plotter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDPLT?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3)

Related Commands: ADDPLT,ADDFC?,ADDPM?,SRC1ADD?,SRC2ADD?

ADDPM Enter power meter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDPM val1`
Val 1: 1-30
Units: XX1

Data I/O: The value is input in ASCII<NRf> format (paragraph 10-3)

Related Commands: ADDPM?,ADDFC,ADDPLT,SRC1ADD,SRC2ADD

ADDPM? Output power meter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDPM?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3)

Related Commands: ADDPM,ADDFC?,ADDPLT?,SRC1ADD?,SRC2ADD?

ADPL Enter electrical length for adapter removal **ADAPTER REMOVAL (Ch 9)**

Syntax: `ADPL val1 unit(s)`
Val 1: A number in ASCII <NRF> format (paragraph 10-3)
Units: Units of time: S, MS, US, PS

ADPL? Output electrical length for adapter removal **ADAPTER REMOVAL (Ch 9)**

Syntax: `ADPL?`

Data I/O: Outputs electrical length for adapter removal using ASCII <NRF> format (paragraph 10-3).

ADRIVE Select the floppy drive as the default drive **DISK FUNCTION (Ch 8)**

Syntax: ADRIVE

Remarks: All disk operations which do not specify a drive will be performed on the floppy drive

Related Commands: CDRIVE, CD, CWD?

AFT Simulate transmission frequency response calibration forward path — **CALIBRATION (Ch 5)**

Syntax: AFT

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1, CON. Also see CFT, OC1

AH0 Turn automatic DUT protection off — **MEASUREMENT (Ch 4)**

Syntax: AH0

Related Commands: AH1, AHX?

AH1 Turn automatic DUT protection on — **MEASUREMENT (Ch 4)**

Syntax: AH1

Related Commands: AH0, AHX?

AHX? Output automatic DUT protection on/off status — **MEASUREMENT (Ch 4)**

Syntax: AHX?

Data I/O: Outputs automatic DUT protection on/off status using ASCII <NR1> format (paragraph 10-3) as follows: "0" for Automatic DUT Protection is off or "1" for Automatic DUT Protection is on.

Related Commands: AH0, AH1

ALC Perform ALC loop internal calibration — **DIAGNOSTICS (Ch 8)**

Syntax: ALC

Remarks: For service use only.

AMKR Select active marker on all channels marker mode **MARKERS (Ch 6)**

Syntax: AMKR

Related Commands: FMKR, NMKR, SMKR, XMKR?

ANNCOL Enter the color number for annotation and menu text **SYSTEM STATE (Ch 8)**

Syntax: ANNCOL
Val 1: 0 to 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Related Commands: DATCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, ANNCOL?

ANNCOL? Output the color number for annotation and menu text **SYSTEM STATE (Ch 8)**

Syntax: ANNCOL?

Data I/O: Outputs the color palette number in ASCII <NR1> format (paragraph 10-3)..

Related Commands: DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, ANNCOL

AOF Turn averaging off **ENHANCEMENT (Ch 4)**

Syntax: AOF

Remarks: Restarts the sweep. Does not change the currently set number.

Related Commands: AVG, WFS

AOF? Output averaging on/off status **ENHANCEMENT (Ch 4)**

Syntax: AOF?

Data I/O: Outputs a 1 if ON, 0 if OFF in ASCII <NR1> format (paragraph 10-3).

Related Commands: AOF, AVG

AON Turn averaging on **ENHANCEMENT (Ch 4)**

Syntax: `AON`

Remarks: Restarts the sweep, but does not change the averaging value that is currently set.

Related Commands: AVG, AOF, WFS

APR Enter group delay aperture setting on active channel **DISPLAY (Ch 4)**

Syntax: `APR val1 unit(s)`
Val 1: 0.0 to 20.0
Units: XX1, XX3, XM3

Related Commands: CH1-CH4, DLA

APR? Output group delay aperture setting on active channel **DISPLAY (Ch 4)**

Syntax: `APR?`

Data I/O: Outputs value in ASCII <NR3 > format (paragraph 10-3).

ARB Simulate reflection only calibration both ports **CALIBRATION (Ch 5)**

Syntax: `ARB`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC6, CON. Also see CRB, OC1-OC6.

ARF Simulate reflection only calibration port 1 **CALIBRATION (Ch 5)**

Syntax: `ARF`

ARB

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC6, CON. Also see CRB, OC1-OC6.

ARR Simulate reflection only calibration port 2 **CALIBRATION (Ch 5)**

Syntax: `ARR`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC3, CON. Also see CRR, OC1-OC3

ART Simulate trans freq response calibration reverse path **CALIBRATION (Ch 5)**

Syntax: `ART`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1, CON. Also see CRT, OC1

ASC Autoscale the active channel display **DISPLAY (Ch 4)**

Syntax: `ASC`

Remarks: For best results, wait for a full sweep before issuing command.

Related Commands: CH1-CH4, WFS

ASP Enter polar stop sweep position angle **DISPLAY (Ch 4)**

Syntax: `ASP val1 unit(s)`
Val 1: -360.00 to 360.00
Units: DEG

Related Commands: CH1-CH4, PCP, PCS, AST

ASP? Output polar stop sweep position angle **DISPLAY (Ch 4)**

Syntax: `ASP?`

Data I/O: Outputs value in ASCII <NR3> format (paragraph 10-3).

AST Enter polar start sweep position angle **DISPLAY (Ch 4)**

Syntax: `AST val1 unit(s)`
Val 1: -360.00 to 360.00
Units: DEG

Related Commands: CH1-CH4, PCP, PCS, ASP

AST? Output polar start sweep position angle **DISPLAY (Ch 4)**

Syntax: `AST?`

Data I/O: Outputs value in ASCII <NR3> format (paragraph 10-3).

ATTN Attach next segment and make the active segment **LIMITS (Ch 6)**

Syntax: `ATTN`

Related Commands: CH1-CH4, L01-L10, U01-U10, DIS, BEGN

AVG Enter averaging count and turn on **ENHANCEMENT (Ch 4)**

Syntax: `AVG val1 unit(s)`
Val 1: 1 to 4095
Units: XX1, XX3, XM3

Remarks: Restarts the sweep.

Related Commands: AOF

AVG? Output averaging count **ENHANCEMENT (Ch 4)**

Syntax: `AVG?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

BBL Select broadband load for calibration — CALIBRATION (Ch 5)

Syntax: `BBL`

Related Commands: SLD

BBZ Enter broadband load impedance for calibration — CALIBRATION (Ch 5)

Syntax: `BBZ val1 unit(s)`
Val 1: 1.0 to 9999.99
Units: XX1, OHM

BBZL Enter broadband load inductance for calibration — CALIBRATION (Ch 5)

Syntax: `BBZL val1 unit(s)`
Val 1: inductance value in ASCII <NRF> format (paragraph 10-3).
Units: XX1

BC0 Turn CRT display off (disabled) — SYSTEM STATE (Ch 8)

Syntax: `BC0`

Related Commands: BC1, BCX?

BC1 Turn CRT display on (disabled) — SYSTEM STATE (Ch 8)

Syntax: `BC1`

Related Commands: BC0, BCX?

BCKCOL Enter the color number for background — SYSTEM STATE (Ch 8)

Syntax: `BCKCOL val1`
Val 1: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, BCKCOL?

BCKCOL? Output the color number for background — SYSTEM STATE (Ch 8)

Syntax: BCKCOL?

Data I/O: Outputs the color palette number in ASCII <NR1> format

Related Commands: ANNCOL, DATCOL?, GRTCOL?, LAYCOL, MKRCOL?, MNUCOL?, TRCCOL?, BCKCOL

BCX? Output CRT display on/off status **SYSTEM STATE (Ch 8)**

Syntax: BCX?

Data I/O: Outputs a 1 if ON, 0 if off in ASCII <NR1> format (paragraph 10-3).

Related Commands: BC0, BC1

BD1 Select band 1 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD1

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Related Commands: SVB, CLB

BD2 Select band 2 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD2

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Related Commands: SVB, CLB

BD3 Select band 3 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD3

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Related Commands: SVB, CLB

BD4 Select band 4 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD4

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Related Commands: SVB, CLB

BD5 Select band 5 for definition — MULTIPLE SOURCE CONTROL (Ch 9)

Syntax: BD5

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Related Commands: SVB, CLB

BDMM Define Millimeter Wave band equations — MILLIMETER WAVE (Ch 9)

Syntax: BDMM

Remarks: Send this prior to redefining the equations for Millimeter Wave

Related Commands: BSP, BST, ED1, ED2, EDR, EDV, EML, EOS, CLBMM, SVBMM

BEEP0 Disable the instrument beeper on GPIB errors — SYSTEM STATE (Ch 8)

Syntax: BEEP0

Related Commands: BEEP1, BEEPX?

BEEP1 Enable the instrument beeper on GPIB errors — SYSTEM STATE (Ch 8)

Syntax: BEEP1

Related Commands: BEEP0, BEEPX?

BEEPX? Output GPIB beep on error enable/disable status — SYSTEM STATE (Ch 8)

Data I/O: Outputs a value using ASCII <NR1> format (paragraph 10-3) as follows: "0" for beep disabled or "1" for beep enabled.

Related Commands: BEEP0, BEEP1

BEG Begin taking calibration data — **CALIBRATION (Ch 5)**

Syntax: BEG

Remarks: After calibration parameters are configured (see CALIBRATION group), use this command to start measuring calibration standards (data-collection process). The prompt to connect the first standard will be displayed. After prompt's action is carried out, issue commands to take calibration data for that standard and then go to next calibration step.

Status Reporting: Extended Event Status Register bit 0 will be set when all calibration standards have been measured and the entire calibration process is complete.

Related Commands: TC1, TC2, TCD, NCS, RPC, KEC

BEGN Begin next segment and make it the active segment — **LIMITS (Ch 6)**

Syntax: BEGN

Related Commands: ATTN

BH0 Turn bias off while in hold — **MEASUREMENT (Ch 4)**

Syntax: BH0

Related Commands: BH1, BHX?, HLD

BH1 Turn bias on while in hold — **MEASUREMENT (Ch 4)**

Syntax: BH1

Related Commands: BH0, BHX?, HLD

BHX? Output bias on/off during hold status — **MEASUREMENT (Ch 4)**

Syntax: BHX?

Data I/O: Output bias on/off during hold status using ASCII <NR1> format (paragraph 10-3): "1" for ON or "0" for OFF.

Related Commands: BH0, BH1

BMPB Select Black on White as bitmap type **HARD COPY (Ch 8)**

Syntax: `BMPB`

Remarks: Defines the bitmap response type to the mnemonic OBMP or SAVE

Related Commands: BMPC, BMPT, OBMP, SAVE

BMPC Select Color on White as bitmap type **HARD COPY (Ch 8)**

Syntax: `BMPC`

Remarks: Defines the bitmap response type to the mnemonic OBMP or SAVE

Related Commands: BMPB, BMPT, OBMP, SAVE

BMPT Select true color as bitmap type **HARD COPY (Ch 8)**

Syntax: `BMPT`

Remarks: Defines the bitmap response type to the mnemonic OBMP or SAVE

Related Commands: BMPB, BMPC, OBMP, SAVE

BPF Enter break point frequency for 3 line LRL calibration **CALIBRATION (Ch 5)**

Syntax: `BPF val1 unit(s)`
Val 1: frequency
Units: HZ, KHZ, MHZ, GHZ

BSP Enter band stop frequency **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `BSP val1 unit(s)`
Val 1: frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Except for band 1, only band stop frequencies can be set. Band start frequencies are automatically set to the previous band's end frequency.

Related Commands: BST, BSP?

BSP? Output band stop frequency **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `BSP?`

Data I/O: Outputs band stop frequency using ASCII <NR3> format (paragraph 10-3).

Related Commands: BST, BSP

BST Enter band start frequency **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `BST val1 unit(s)`
Val 1: frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Only band 1 start frequency can be set. Bands 2-5 automatically start at the end of the previous band.

Related Commands: BSP

BST? Output band start frequency **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `BST?`

Data I/O: Outputs value in ASCII <NR3> format (paragraph 10-3).

BWL3 Set bandwidth loss value to 3 dB **MARKERS (Ch 6)**

Syntax: `BWL3`

Related Commands: FMKR, BWLS, BWLS?

BWLS Enter bandwidth loss value **MARKERS (Ch 6)**

Syntax: `BWLS val1 unit(s)`
Val 1: Depends on graph type; refer to Table 11-2 at the end of this chapter.
Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Related Commands: FMKR, BWL3, BWLS?

BWLS? Output bandwidth loss value **MARKERS (Ch 6)**

Syntax: `BWLS?`

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: BWL3, BWLS

C12 Select 12 term calibration — CALIBRATION (Ch 5)

Syntax: `C12`

C8R Select 1-path 2-port calibration reverse path — CALIBRATION (Ch 5)

Syntax: `C8R`

C8T Select 1-path 2-port calibration forward path — CALIBRATION (Ch 5)

Syntax: `C8T`

CALR Perform receiver cal for gain compression testing — GAIN COMPRESSION (Ch 9)

Syntax: `CALR`

Remarks: A receiver calibration is one of the required steps in both swept frequency and swept power gain compression testing.

Related Commands: SFGCA, SPGCA, NRMS, UNDOGC

CAS Clear active segmented limit vertical/horizontal definitions — LIMITS (Ch 6)

Syntax: `CAS`

CBT Select trans freq response calibration forward and reverse — CALIBRATION (Ch 5)

Syntax: `CBT`

CC0 Enter capacitance coefficient 0 for open — CALIBRATION (Ch 5)

Syntax: `CC0 val1 unit(s)`
Val 1: -9999.99 to 9999.99
Units: XX1

Related Commands: P1C, P2C

CC1 Enter capacitance coefficient 1 for open **CALIBRATION (Ch 5)**

Syntax: `CC1 val1 unit(s)`
Val 1: -9999.99 to 9999.99
Units: XX1

Related Commands: P1C, P2C

CC2 Enter capacitance coefficient 2 for open **CALIBRATION (Ch 5)**

Syntax: `CC1 val1 unit(s)`
Val 1: -9999.99 to 9999.99
Units: XX1

Related Commands: P1C, P2C

CC3 Enter capacitance coefficient 3 for open **CALIBRATION (Ch 5)**

Syntax: `CC3 val1 unit(s)`
Val 1: -9999.99 to 9999.99
Units: XX1

Related Commands: P1C, P2C

CCD Collect corrected data in an internal buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `CCD`

Remarks: Sets up an internal buffer to collect Corrected Data.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CRD, CFD, CXD?, DCCTN, DCCTN?, DCHLD, DCMRK, DCOFF

CD Change default directory **DISK FUNCTION (Ch 8)**

Syntax: `CD "pathspec"`
Val 1: Pathspec is a combination of letters, numbers, \ characters and underscores which spell out the pathspec to the subdirectory in question

Related Commands: ADRIVE, CDRIVE, CWD?

CDRIVE Select the hard disk as the default drive — DISK FUNCTION (Ch 8)

Syntax: CDRIVE

Remarks: All disk operations which do not specify a drive will be performed on the hard drive.

Related Commands: ADRIVE, CD, CWD?

CF2 Select female 2.4mm connector for current port — CALIBRATION (Ch 5)

Syntax: CF2

Related Commands: P1C, P2C

CF3 Select female GPC-3.5 connector for current port — CALIBRATION (Ch 5)

Syntax: CF3

Related Commands: P1C, P2C

CFC Select female TNC connector for current port — CALIBRATION (Ch 5)

Syntax: CFC

Related Commands: P1C, P2C

CFD Collect final data in an internal buffer — INT. BUFFER DATA COLL. (Ch 7)

Syntax: CFD

Remarks: Sets up an internal buffer to collect Final Data.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CRD, CXD?, DCCTN, DCCTN?, DCHLD, DCMRK, DCOFF

CFK Select female K connector for current port — CALIBRATION (Ch 5)

Syntax: CFK

Related Commands: P1C, P2C

CFN Select female Type N connector for current port — CALIBRATION (Ch 5)

Syntax: CFN

Related Commands: P1C, P2C

CFN75 Select Female type N 75-ohm connector for current port — CALIBRATION (Ch 5)

Syntax: CFN75

Related Commands: P1C, P2C

CFS Select female SMA connector for current port — CALIBRATION (Ch 5)

Syntax: CFS

Related Commands: P1C, P2C

CFSP Select Special Female connector for current port — CALIBRATION (Ch 5)

Syntax: CFSP

Related Commands: P1C, P2C

CFT Select trans freq response calibration forward path — CALIBRATION (Ch 5)

Syntax: CFT

CFV Select female V connector for current port — CALIBRATION (Ch 5)

Syntax: CFV

Related Commands: P1C, P2C

CH1 Make channel 1 the active channel — CHANNELS (Ch 4)

Syntax: CH1

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed.

The channel display mode (single, dual, dual overlaid, or quad), however, will be maintained.

Related Commands: CHX?, WFS

CH2 Make channel 2 the active channel **CHANNELS (Ch 4)**

Syntax: `CH2`

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed. The channel display mode (single, dual, dual overlaid, or quad), however, will be maintained.

Related Commands: CHX?, WFS

CH3 Make channel 3 the active channel **CHANNELS (Ch 4)**

Syntax: `CH3`

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed. The channel display mode (single, dual, dual overlaid, or quad), however, will be maintained.

Related Commands: CHX?, WFS

CH4 Make channel 4 the active channel **CHANNELS (Ch 4)**

Syntax: `CH4`

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed. The channel display mode however, (single, dual, dual overlaid, or quad), will be maintained

Related Commands: CHX?, WFS

CHX? Output active channel number **CHANNELS (Ch 4)**

Syntax: `CHX?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

CL0 Enter inductive coefficient 0 for short **CALIBRATION (Ch 5)**

Syntax: `CL0 val1 unit(s)`
Val 1: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E02 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (paragraph 10-3).

CL1 Enter inductive coefficient 1 for short **CALIBRATION (Ch 5)**

Syntax: `CL1 val1 unit(s)`
Val 1: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E-24 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (paragraph 10-3).

CL2 Enter inductive coefficient 2 for short **CALIBRATION (Ch 5)**

Syntax: `CL2 val1 unit(s)`
Val 1: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E-33 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (paragraph 10-3).

CL3 Enter inductive coefficient 3 for short **CALIBRATION (Ch 5)**

Syntax: `CL3 val1 unit(s)`
Val 1: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E-42 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (paragraph 10-3).

CLB Clear all multiple source band definitions **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `CLB`

CLBMM Clear the new Millimeter Wave band definitions — MILLIMETER WAVE (Ch 9)

Remarks: Sets the Millimeter Wave band definitions to the default values

Related Commands: BSP, BST, ED1, ED2, EDR, EDV, EML, EOS, BDMM, SVBMM

CM Suffix sets distance data type and scales by 1E-2 — DATA ENTRY SUFFIXES (Ch 4)

Syntax: CM

Related Commands: CMT

CM2 Select male 2.4mm connector for current port — CALIBRATION (Ch 5)

Syntax: CM2

Related Commands: P1C, P2C

CM3 Select male GPC-3.5 connector for current port — CALIBRATION (Ch 5)

Syntax: CM3

Related Commands: P1C, P2C

CMC Select male TNC connector for current port — CALIBRATION (Ch 5)

Syntax: CMC

Related Commands: P1C, P2C

CMK Select male K connector for current port — CALIBRATION (Ch 5)

Syntax: CMK

Related Commands: P1C, P2C

CMN Select male N connector for current port — CALIBRATION (Ch 5)

Syntax: CMN

Related Commands: P1C, P2C

CMN75 Select Male type N 75-Ohm connector for current port — **CALIBRATION (Ch 5)**

Syntax: CMN75

Related Commands: P1C, P2C

CMS Select male SMA connector for current port — **CALIBRATION (Ch 5)**

Syntax: CMS

Related Commands: P1C, P2C

CMSP Select Special Male connector for current port — **CALIBRATION (Ch 5)**

Syntax: CMSP

Related Commands: P1C, P2C

CMT Suffix sets distance data type and scales by 1E-2 — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: CMT

Related Commands: CM

CMV Select male V connector for current port — **CALIBRATION (Ch 5)**

Syntax: CMV

Related Commands: P1C, P2C

CMX? Output calibration method — **CALIBRATION (Ch 5)**

Syntax: CMX?

Data I/O: Output calibration method using ASCII <NR1> format (paragraph 10-3). Outputs as follows: "1" for Standard OSL, "2" for Offset-Short or "3" for LRL/LRM.

CND Select user specified connector for current port — **CALIBRATION (Ch 5)**

Syntax: CND

Remarks: Enter specifications of the standard devices to be used during the calibration.

Related Commands: P1C, P2C, CC0-CC3, COO, COS

CNG Select GPC-7 connector for current port **CALIBRATION (Ch 5)**

Syntax: `CNG`

Related Commands: P1C, P2C

CNTR Enter center frequency **MEASUREMENT (Ch 4)**

Syntax: `CNTR val1 unit(s)`
Val 1: Can be any frequency from low frequency limit to high frequency limit of 37XXX
Units: HZ, KHZ, MHZ, GHZ

Related Commands: CNTR?, SPAN, SPAN?, SRT, SRT?, STP, STP?

CNTR? Output center frequency **MEASUREMENT (Ch 4)**

Syntax: `CNTR?`

Data I/O: Output center frequency using ASCII <NR3> format (paragrah 11-3).

Related Commands: CNTR, SPAN, SPAN?, SRT, SRT?, STP, STP?

COF Turn error correction off **CALIBRATION (Ch 5)**

Syntax: `COF`

Remarks: Restarts the sweep.

Related Commands: CON

CON Turn error correction on **CALIBRATION (Ch 5)**

Syntax: `CON`

Remarks: Restarts the sweep.

Related Commands: CON

CON? Output error correction on/off status — **CALIBRATION (Ch 5)**

Syntax: `CON?`

Data I/O: Output error correction on/off status using ASCII <NR1> format (paragraph 10-3): "1" for ON or "0" for OFF.

COO Enter offset for open for user specified connector — **CALIBRATION (Ch 5)**

Syntax: `COO val1 unit(s)`
Val 1: -999.9999 to 999.9999 (meters)
Units: M, MTR, MM, MMT, CM, CMT

COPY Copy a files contents to another file — **DISK FUNCTION (Ch 8)**

Syntax: `COPY "sourcename", "targetname"`
Val 1: Source name specifies the filespec for the source file. Targetname specifies the filespec for the target file. If the names contain extentions, then the extentions must be included. May contain drive letters, paths and/or wildcards

Related Commands: DEL

COS Enter offset for short for user specified connector — **CALIBRATION (Ch 5)**

Syntax: `M, MTR, MM, MMT, CM, CMT`
Val 1: -999.999to 999.999(meters)
Units: M, MTR, MM, MMT, CM, CMT

CRB Select reflection only calibration both ports — **CALIBRATION (Ch 5)**

Syntax: `CRB`

CRD Collect raw data in an internal buffer — **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `CRD`

Remarks: Sets up an internal buffer to collect Raw Data.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CFD, CXD?, DCCTN, DCCTN?, DCHLD, DCMRK, DCOFF

CRF Select reflection only calibration port 1 — CALIBRATION (Ch 5)

Syntax: CRF

CRR Select reflection only calibration port 2 — CALIBRATION (Ch 5)

Syntax: CRR

CRT Select trans freq response calibration reverse path — CALIBRATION (Ch 5)

Syntax: CRT

CSB Clear status bytes and structures (same as *CLS) — STATUS REPORTING (Ch 7)

Syntax: CSB

Related Commands: *CLS

CSF? Output cal start frequency — CALIBRATION (Ch 5)

Syntax: CSF?

Data I/O: Outputs value in ASCII <NR3> format (paragraph 10-3).

CSL Clear service log — SERVICE LOG (Ch 8)

Syntax: CSL

Remarks: This command will erase permanently any error messages in the service log. Typically for service use only.

Related Commands: OEL, OSL, SSL, PSL, ONE

CTF? Output cal stop frequency — CALIBRATION (Ch 5)

Syntax: CTF?

Data I/O: Outputs value in ASCII <NR3> format (paragraph 10-3).

CTN Continue sweeping from current point — MEASUREMENT (Ch 4)

Syntax: CTN

Remarks: Takes the instrument out of hold mode and continues sweeping from the current frequency.

Related Commands: HLD, TRS

CWC Select CW frequency calibration data points **CALIBRATION (Ch 5)**

Syntax: `CWC`

Related Commands: CWF, NOC, TDC, DFC

CWD? Output current working directory string **DISK FUNCTION (Ch 8)**

Syntax: `CWD?`

Data I/O: Outputs a string in <Arbitrary ASCII> format which contains the complete path including the drive letter.

Related Commands: ADRIVE, CDRIVE, CD

CWF Enter CW frequency and turn CW on **MEASUREMENT (Ch 4)**

Syntax: `CWF val1 unit(s)`
Val 1: CW freq
Units: HZ, KHZ, MHZ, GHZ

Remarks: Restarts the sweep.

Related Commands: WFS, SWP, SRT, STP

CWF? Output CW frequency **MEASUREMENT (Ch 4)**

Syntax: `CWF?`

Data I/O: Outputs value in ASCII <NR3> format (paragraph 10-3).

CWON Turn CW on at current CW frequency **MEASUREMENT (Ch 4)**

Syntax: `CWON`

Remarks: Restarts the sweep.

Related Commands: CWF

CWON? Output CW on/off status **MEASUREMENT (Ch 4)**

Syntax: `CWON?`

Data I/O: Outputs CW on/off status using ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

CWP Enter number of points drawn in CW **MEASUREMENT (Ch 4)**

Syntax: `CWP val1 unit(s)`
Val 1: 1 to 1601
Units: XX1

Remarks: This is a CW "sweep" mode where the data trace represents consecutive measurements at the same CW frequency. Restarts the sweep.

Related Commands: WFS, DD0, DD1, CWF, SWP

CWP? Output number of points drawn in CW **MEASUREMENT (Ch 4)**

Syntax: `CWP?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

CXD? Output internal buffer data collection mode **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `CXD?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0" for No Collection Mode, "1" for Raw Data Collection, "2" for Corrected Data Collection, or "3" for Final Data Collection.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CFD, CRD, DCOFF

CXX? Output calibration type **CALIBRATION (Ch 5)**

Syntax: `CXX?`

Data I/O: Outputs calibration type using ASCII <NR1> format (paragraph 10-3), as follows: "0" for None, "1" for 12 Term, "2" for 8 Term FWD, "3" for 8 Term REV, "4" for Transmission FWD, "5" for

Transmission REV, "6" for Transmission FWD & REV, "7" for Reflection FWD, "8" for Reflection REV, or "9" for Reflection FWD & REV).

D13 Display channels 1 & 3 **CHANNELS (Ch 4)**

Syntax: `D13`

Remarks: Restarts the sweep.

Related Commands: WFS, T13

D14 Display all four channels **CHANNELS (Ch 4)**

Syntax: `D14`

Remarks: Restarts the sweep.

Related Commands: WFS

D24 Select dual channel display with channels 2 & 4 **CHANNELS (Ch 4)**

Syntax: `D24`

Remarks: Restarts the sweep.

Related Commands: WFS, T24

DA1 Select a1 = Ra as denominator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DA1`

Related Commands: DA2, DB1, DB2, DE1, DEN?

DA2 Select a2 = Rb as denominator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DA2`

Related Commands: DA1, DB1, DB2, DE1, DEN?

DAT Display data only on active channel **DISPLAY (Ch 4)**

Syntax: DAT

Related Commands: DNM

DAT? Output trace memory display mode **DISPLAY (Ch 4)**

Syntax: DAT?

Data I/O: Output trace memory display mode using ASCII <NR1> format (paragraph 10-3), as follows: "1" for Data "2" for Memory, "3" for Data & Memory, or "4" for Data With Memory Mathematically Combined.

Related Commands: MTH?

DATCOL Enter the color number for data **SYSTEM STATE (Ch 8)**

Syntax: DATCOL val1
Val 1: DATCOL val1

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Related Commands: ANNCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, DATCOL?

DATCOL? Output the color number for data **SYSTEM STATE (Ch 8)**

Syntax: DATCOL?

Data I/O: Outputs the color palette number in ASCII <NR1> format.

Related Commands: ANNCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, DATCOL

DATE Enter the system date **SYSTEM STATE (Ch 8)**

Syntax: DATE val1, val2, val3
Val 1: val1, val2 and val3 are in ASCII <NRF> format (paragraph 10-3)

Remarks: val1 is the month (1 - 12), val2 is the day (1 - 31) and val3 is the year (0 - 99). Notice the comma separators. This modifies the system date stored on the processor board.

Related Commands: DATE?, TIME, TIME?

DATE? Output the system date — **SYSTEM STATE (Ch 8)**

Syntax: DATE?

Data I/O: The date is output using ASCII <NR1> format (paragraph 10-3). It uses three numbers separated by commas. The first is the month (1 - 12), the second is the day (1 - 31), and the third is the year (0 - 99).

Related Commands: DATE, TIME, TIME?

DB Suffix sets power data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: DB

Related Commands: DBL, DBM

DB1 Select b1 = Ta as denominator for parameter being defined — **USER DEFINED PARAMETERS (Ch 9)**

Syntax: DB1

Related Commands: DA1, DA2, DB2, DE1, DEN?

DB2 Select b2 = Tb as denominator for parameter being defined — **USER DEFINED PARAMETERS (Ch 9)**

Syntax: DB2

Related Commands: DA1, DA2, DB1, DE1, DEN?

DBL Suffix sets power data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: DBL

Related Commands: DB, DBM

DBM Suffix sets power data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: DBM

Related Commands: DB, DBL

DBP Select distance bandpass mode for active channel — **DIAGNOSTICS (Ch 8)**

Syntax: DBP

DC1 Display channel 1 and 2 operating parameters **SYSTEM STATE (Ch 8)**

Syntax: DC1

DC3 Display channel 3 and 4 operating parameters **SYSTEM STATE (Ch 8)**

Syntax: DC3

DCA Select automatic DC term calculation for low-pass **DIAGNOSTICS (Ch 8)**

Syntax: DCA

DCCTN Resume internal buffer data collection **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: DCCTN

Remarks: Used to commence data collection after a collection mode is set or to resume data collection after being paused with DCHLD.

Related Commands: CCD, CFD, CRD, DCCTN?, DCHLD

DCCTN? Output internal buffer data collection resume/suspend status **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: DCCTN?

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0" for Data Collection is Suspended, "1" for Data Collection is Active.

Related Commands: DCCTN, DCHLD

DCHLD Suspend internal buffer data collection **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: DCHLD

Remarks: Internal buffer data collection will be temporarily suspended to allow parameter changes to be performed.

Related Commands: DCCTN, DCCTN?

DCMRK Inserts the mark value into the internal buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `DCMRK val1 unit(s)`
Val 1: Mark value
Units: Optionally, any of the terminator mnemonics currently supported

Remarks: The value of the number will be inserted as the real portion of the number inserted in the buffer. The imaginary part of the number will be zero. This is to allow the user to mark a spot in the buffer for synchronization and separation.

Data I/O: Enter as an ASCII <NRf> number (paragraph 10-3).

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: DCCTN, DCHLD

DCO Select open for DC term for lowpass **DIAGNOSTICS (Ch 8)**

Syntax: `DC0`

DCOFF Turn internal buffer data collection mode off **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `DCOFF`

Remarks: The internal buffer and all data will be deleted

Related Commands: CCD, CFD, CRD, CXD?

DCP Display calibration parameters 1st page **SYSTEM STATE (Ch 8)**

Syntax: `DCP`

DCP1 Display calibration parameters 1st page **SYSTEM STATE (Ch 8)**

Syntax: `DCP1`

DCP2 Display calibration parameters 2nd page **SYSTEM STATE (Ch 8)**

Syntax: `DCP2`

DCS Select short for DC term for lowpass **TIME DOMAIN (Ch 9)**

Syntax: DCS

DCV Enter value for DC term for lowpass **TIME DOMAIN (Ch 9)**

Syntax: DCV val1 unit(s)
Val 1: -999.999 to 999.999
Units: XX1, XX3, XM3

Related Commands: DCV

DCV? Output lowpass DC term value **TIME DOMAIN (Ch 9)**

Syntax: DCV?

Data I/O: Outputs the value in ASCII <NR3> format.

Related Commands: DCV

DCX? Output lowpass DC term selection **TIME DOMAIN (Ch 9)**

Syntax: DCX?

Data I/O: Outputs lowpass DC term selection using ASCII <NR3> format, as follows: "0" fcor Value, "1" for Auto, "2" for Line Impedence, "3" for Open, or "4" for Short.

Related Commands: DCA, DCO, DCS, DCV, DCZ

DCZ Select line impedance for DC term for lowpass **TIME DOMAIN (Ch 9)**

Syntax: DCZ

DD0 Turn data drawing off **SYSTEM STATE (Ch 8)**

Syntax: DD0

DD1 Turn data drawing on **SYSTEM STATE (Ch 8)**

Syntax: DD1

DD1? Output data drawing on/off status **SYSTEM STATE (Ch 8)**

Syntax: DD1?

Data I/O: Outputs data drawing on/off status using ASCII <NR1> format (paragraph 10-3), as follows: "0" for OFF or "1" for ON.

DDX? Output active channel domain parameter frequency distance or time — **TIME DOMAIN (Ch 9)**

Syntax: `DDX?`

Data I/O: Outputs selection value in ASCII <NR3> format, as follows: "0" for Frequency, "1" for Time, or "2" for Distance.

Related Commands: TDDIST, TDTIME, TDDIST?

DE1 Select unity as denominator for parameter being defined — **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DE1`

Related Commands: DA1, DA2, DB1, DB2, DEN?

DEG Suffix sets phase data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `DEG`

DEL Delete a file from disk — **DISK FUNCTION (Ch 8)**

Syntax: `DEL "filename"`
Val 1: Filename is the name of the file to be deleted, complete with the extention. It may include a drive letter, path and wildcards.

Related Commands: COPY

DEN? Output denominator selection for parameter being defined — **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DEN?`

Data I/O: Outputs its value using ASCII <NR1> format (paragraph 10-3), as follows: "1" for Unity, "2" for a1, "3" for a2, "4" for b1, or "5" for b2.

Related Commands: DA1, DA2, DB1, DB2, DE1

DF2 Display 2.4mm female connector information — **SYSTEM STATE (Ch 8)**

Syntax: `DF2`

DF3 Display GPC-3.5 female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DF3`

DFC Select discrete frequency calibration data points **CALIBRATION (Ch 5)**

Syntax: `DFC`

Related Commands: CWC, TDC, NOC, IFV, Discrete frequency list commands in MEASUREMENT group: DFQ, DFD, FRS, FRI, FRP, FIL, FRC.DFD, FRS, FRI, FRP, FIL, FRC.

DFD Done specifying discrete frequency ranges **CALIBRATION (Ch 5)**

Syntax: `DFD`

Remarks: Requires at least two points to have been entered. See MEASUREMENT/DISCRETE FREQUENCY LIST description.

DFK Display K female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFK`

DFN Display N female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFN`

DFN75 Display N Female 75-Ohm connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFN75`

DFP Display Front panel instrument state **SYSTEM STATE (Ch 8)**

Syntax: `DFP`

DFQ Enter single discrete frequency **CALIBRATION (Ch 5)**

Syntax: `DFQ val1 unit(s)`

Val 1: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: The frequency must be within start sweep freqency and stop sweep frequency.

DFS Display SMA female connector information — SYSTEM STATE (Ch 8)

Syntax: `DFS`

DFSP Display Special Female connector information — SYSTEM STATE (Ch 8)

Syntax: `DFSP`

DFT Display TNC female connector information — SYSTEM STATE (Ch 8)

Syntax: `DFT`

DFV Display V female connector information — SYSTEM STATE (Ch 8)

Syntax: `DFV`

DG7 Display GPC-7 Male connector information — SYSTEM STATE (Ch 8)

Syntax: `DG7`

DGS Display GPIB status information — SYSTEM STATE (Ch 8)

Syntax: `DGS`

DGT Display 1st CRT test pattern — PERIPHERAL TESTS (Ch 8)

Syntax: `DGT`

Remarks: For service use only (same as DGT1).

DGT1 Display 1st CRT test pattern — PERIPHERAL TESTS (Ch 8)

Syntax: `DGT1`

Remarks: For service use only.

DGT2 Display 2nd CRT test pattern **PERIPHERAL TESTS (Ch 8)**

Syntax: `DGT2`

Remarks: For service use only.

DGT3 Display 3rd CRT test pattern **PERIPHERAL TESTS (Ch 8)**

Syntax: `DGT3`

Remarks: For service use only.

DIA Select air as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIA val1 unit(s)`

Remarks: Value is set to air dielectric value (1.000649). Value Impacts time domain distance calculations and reference plane position settings.

DIE Enter a dielectric value **DISPLAY (Ch 4)**

Syntax: `DIE val1 unit(s)`
Val 1: 1 to 999.999
Units: XX1, XX3, XM3

Remarks: Impacts time domain distance calculations and reference plane position settings.

DIM Select microporous teflon as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIM`

Remarks: Value set to microporous teflon dielectric value (1.69). Value impacts time domain distance calculations and reference plane position settings.

DIP Select polyethylene as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIP`

Remarks: Value set to polyethylene dielectric value (2.26). Value impacts time domain distance calculations and reference plane position settings.

DIR Output a directory listing to the GPIB **DISK FUNCTION (Ch 8)**

Syntax: `DIR "pathspec"`

Val 1: Path to the directory in question and a filename filter, if desired. May contain a drive letter and wildcards.

Data I/O: Outputs data in an <Arbitrary Block> format (paragraph 10-3) containing a heavily formatted ASCII listing similar to one obtained from a DOS-based machine.

Related Commands: ADRIVE, CDRIVE, CD, CWD?, FMT1

DIS Display active segmented limit **LIMITS (Ch 6)**

Syntax: `DIS`

Remarks: Displays the active segmented limit. Requires SLA or SLL, as appropriate.

DIS? Output active segmented limit on/off status **LIMITS (Ch 6)**

Syntax: `DIS?`

Data I/O: Output active segmented limit on/off status using <NR1> format (paragraph 10-3), as follows: "0" for OFF or "1" for ON.

DISKRD Output disk file data to the GPIB **DISK FUNCTION (Ch 8)**

Syntax: `DISKRD "filespec"`

Val 1: Filespec is a string containing the filename and optional drive letter and path. If the file has an extention, it must be included in the filespec string. Wildcards are not allowed.

Data I/O: Outputs an <Arbitrary Block> (paragraph 10-3) containing the contents of the file.

Related Commands: DISKWR

DISKWR Write GPIB data to a disk file **DISK FUNCTION (Ch 8)**

Syntax: `DISKWR "filespec", val1`

Val 1: File extension, if desired.

Remarks: If the extention is desired on the filename, it must be included as Val1.

Data I/O: Enter filename/file extension as an <Arbitrary Block> (paragraph 10-3). Notice the comma separator.

Related Commands: DISKRD

DIT Select Teflon as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIT`

Remarks: Impacts time domain distance calculations and reference plane position settings.

DIV Select division as trace math for active channel **DISPLAY (Ch 4)**

Syntax: `DIV`

Remarks: Selects division as trace math for the active channel.

Related Commands: DNM, CH1-CH4

DIX? Output dielectric constant **DISPLAY (Ch 4)**

Syntax: `DIX?`

Data I/O: Outputs an ASCII value in <NR3 > format (paragraph 10-3).

DLA Select group delay display for active channel **DISPLAY (Ch 4)**

Syntax: `DLA`

Related Commands: CH1-CH4, IMG, ISC, ISE, ISM, IMG, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

DLP Select distance lowpass mode for active channel **DIAGNOSTICS (Ch 8)**

Syntax: `DLP`

DM2 Display 2.4mm male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DM2`

DM3 Display GPC-3.5 male connector information — SYSTEM STATE (Ch 8)

Syntax: DM3

DMK Display K male connector information — SYSTEM STATE (Ch 8)

Syntax: DMK

DMN Display N male connector information — SYSTEM STATE (Ch 8)

Syntax: DMN

DMN75 Display N Male 75-Ohm connector information — SYSTEM STATE (Ch 8)

Syntax: DMN75

DMS Display SMA male connector information — SYSTEM STATE (Ch 8)

Syntax: DMS

DMSP Display Special Male connector information — SYSTEM STATE (Ch 8)

Syntax: DMSP

DMT Display TNC male connector information — SYSTEM STATE (Ch 8)

Syntax: DMT

DMV Display V male connector information — SYSTEM STATE (Ch 8)

Syntax: DMV

DNM Display data normalized to trace memory on active channel — DISPLAY (Ch 4)

Syntax: DNM

Remarks: Store data from selected channel to memory (STD command), before using this command to view a trace with trace memory active.

Related Commands: DIV, MUL, ADD, MIN, CH1-CH4, STD, WFS

DPI Select distance phasor impulse mode for active channel — **TIME DOMAIN (Ch 9)**

Syntax: `DPI`

Related Commands: CH1-CH4

DPN Enter pen number for data — **HARD COPY (Ch 8)**

Syntax: `DPN val1 unit(s)`
Val 1: 1 to 8
Units: XX1

DPR0 Visible data only OFD format — **DATA TRANSFER (Ch 7)**

Syntax: `DPR0`

Remarks: See DPR1 for details.

DPR1 Data pair always OFD format — **DATA TRANSFER (Ch 7)**

Syntax: `DPR1`

Remarks: This is a data formatting command for the OFD/IFD and OM1-OM6 commands that allows for sending complex data pairs (i.e., mag/phase or real/ imaginary) while using single graph displays (i.e. log mag or real), as if the related dual graph type was selected.

The data element not currently measured on the single display will be zeroed out. For example: if the log mag graph type is selected for the active channel and "DPR1; OFD" is issued, the data will be sent out in the same format as if the log mag/phase graph type was active(dB, degrees).

The only difference is the phase value will be zeroed out (dB, 0). Similarly, if "DPR1;OFD" is issued while a phase display is selected for the active channel, the data will be output as if the log mag/phase display was selected, except that the magnitude value will be zeroed out (0, degrees). See Table 7-7 for data output format information for all display types.

This command is useful in developing a standard data transfer

routine in your application program, but it will impact throughput speed (for single displays only).

Related Commands: DPR0, OFD, IFD, OM1-OM12

DPRX? Output data pair mode visible only or pair always — **MEASUREMENT DATA (Ch 7)**

Syntax: `DPRX?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0: for Visible Only or "1" for Data Pair Always.

Related Commands: DPR0, DPR1

DR1 Select Marker 1 as Delta Reference Marker — **MARKERS (Ch 6)**

Syntax: `DR1`

DR2 Select Marker 2 as Delta Reference Marker — **MARKERS (Ch 6)**

Syntax: `DR2`

DR3 Select Marker 3 as Delta Reference Marker — **MARKERS (Ch 6)**

Syntax: `DR3`

DR4 Select Marker 4 as Delta Reference Marker — **MARKERS (Ch 6)**

Syntax: `DR4`

DR5 Select Marker 5 as Delta Reference Marker — **MARKERS (Ch 6)**

Syntax: `DR5`

DR6 Select Marker 6 as Delta Reference Marker — **MARKERS (Ch 6)**

Syntax: `DR6`

DRF Turn delta reference mode on — **MARKERS (Ch 6)**

Syntax: `DRF`

Related Commands: DR1-DR12

DRL Diagnostic read latch **DIAGNOSTICS (Ch 8)**

Syntax: `DRL`

Remarks: For service use only.

DRO Turn delta reference mode off **MARKERS (Ch 6)**

Syntax: `DRO`

DRO? Output delta reference mode on/off status **MARKERS (Ch 6)**

Syntax: `DRO?`

Data I/O: OutputS delta reference mode on/off status using ASCII <NR1 > format (paragraph 10-3), as follows: "1" for ON or "0" for OFF.

DRX? Output delta reference marker number **MARKERS (Ch 6)**

Syntax: `DRX?`

Data I/O: Output delta reference marker number using ASCII value in <NR1> format (paragraph 10-3).

DSF0 Disable filter shape factor calculation **MARKERS (Ch 6)**

Syntax: `DSF0`

Related Commands: DSF1, DSFX?

DSF1 Enable filter shape factor calculation **MARKERS (Ch 6)**

Syntax: `DSF1`

Related Commands: DSF0, DSFX?

DSFX? Output filter shape factor calculation enable/disable status **MARKERS (Ch 6)**

Syntax: `DSFX?`

Data I/O: Outputs its value using ASCII <NR1> format (paragraph 10-3), as follows: "0" for OFF or "1" for ON.

Related Commands: DSF0, DSF1

DSP Select single channel display **CHANNELS (Ch 4)**

Syntax: `DSP`

Related Commands: CH1-CH4

DSP? Output channel display mode **CHANNELS (Ch 4)**

Syntax: `DSP?`

Data I/O: Outputs channel display mode using ASCII <NR1> format (paragraph 10-3), as follows: "1" for Single, "13" for Dual 1&3, "24" for Dual 2&4, "4" for Quad, "130" for Dual Overaly 1&3, "240" for Dual Overlay 2&4.

Related Commands: CH1-CH4

DSQ0 Disable filter Q calculation **MARKERS (Ch 6)**

Syntax: `DSQ0`

Related Commands: DSQ1, DSQX?

DSQ1 Enable filter Q calculation **MARKERS (Ch 6)**

Syntax: `DSQ1`

Related Commands: DSQ0, DSQX?

DSQX? Output filter Q calculation enable/disable status **MARKERS (Ch 6)**

Syntax: `DSQX?`

Data I/O: Outputs filter Q calculation enable/disable status using ASCII <NR1> format (paragraph 10-3), as follows: "0" for OFF or "1" for ON.

Related Commands: DSQ0, DSQ1

DTM Display measurement data and trace memory on active channel — DISPLAY (Ch 4)

Syntax: DTM

Remarks: Store data from selected channel to memory (STD command), before using this command to view a trace with trace memory active.

Related Commands: STD

DVM Enter DVM channel number — DIAGNOSTICS (Ch 8)

Syntax: DVM

Remarks: For service use only.

DWG Display waveguide parameters — SYSTEM STATE (Ch 8)

Syntax: DWG

DWL Diagnostic write latch — DIAGNOSTICS (Ch 8)

Syntax: DWL

Remarks: For service use only.

E12 Set Millimeter Wave band to E band (WR-12) — MILLIMETER WAVE (Ch 9)

Syntax: E12

E12E Set Millimeter Wave band to E band (WR-12) — MILLIMETER WAVE (Ch 9)

Syntax: E12E

ECW Select CW operation for component being edited — MULTIPLE SOURCE CONTROL (Ch 9)

Syntax: ECW

ED1 Edit source 1 equation — MULTIPLE SOURCE CONTROL (Ch 9)

Syntax: ED1

Remarks: See Chapter 10, paragraph 10-3.

ED2 Edit source 2 equation **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `ED2`

Remarks: See Chapter 10, paragraph 10-3.

EDG End diagnostics mode **DIAGNOSTICS (Ch 8)**

Syntax: `EDG`

Remarks: For service use only.

EDR Edit receiver equation **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EDR`

Remarks: See Chapter 10, paragraph 10-3.

EDV Enter divisor value for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EDV val1 unit(s)`
Val 1: 099 to 0, 1 to 199
Units: XX1, XX3, XM3

Remarks: See Chapter 10, paragraph 10-3.

EDV? Output divisor value for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EDV?`

Data I/O: Outputs its value using ASCII <NR3 > format (paragraph 10-3). See Chapter 10, paragraph 10-3.

EKT Select external keyboard testing **PERIPHERAL TESTS (Ch 8)**

Syntax: `EKT`

Remarks: For service use only.

EML Enter multiplier value for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EML val1 unit(s)`
Val 1: 099 to 0, 1 to 199
Units: XX1, XX3, XM3

Remarks: See Chapter 10, paragraph 10-3.

EML? Output multiplier value for equation being edited — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EML?`

Data I/O: Outputs its value using ASCII <NR3 > format (paragraph 10-3). See Chapter 10, paragraph 10-3.

EOS Enter offset frequency for equation being edited — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EOS val1 unit(s)`
Val 1: -999.9999 GHz to 999.9999 GHz
Units: HZ, KHZ, MHZ, GHZ

Remarks: See Chapter 10, paragraph 10-3.

EOS? Output offset frequency for equation being edited — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EOS?`

Data I/O: Outputs its value using ASCII <NR3 > format (paragraph 10-3). See Chapter 10, paragraph 10-3.

ESW Select sweep operation for component being edited — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `ESW`

Remarks: See Chapter 10, paragraph 10-3.

EXD Display external A/D input — **DIAGNOSTICS (Ch 8)**

Syntax: `EXD`

Remarks: For service use only.

EXISTD? Output directory existence information — **DISK FUNCTION (Ch 8)**

Syntax: `EXISTD? "pathspec"`

Val 1: Pathspec is the path to the directory in question. It may contain a drive letter.

Data I/O: Output directory existence information using ASCII <NR1> format (paragraph 10-3), as follows: "0" for directory does not exist, "1" for directory exists.

Related Commands: EXISTF?

EXISTF? Output file existence information **DISK FUNCTION (Ch 8)**

Syntax: `EXISTF? "filespec"`

Val 1: Filespec is a string containing the filename to check. It may contain a drive letter and path.

Data I/O: Outputs file existence information using ASCII <NR1> format (paragraph 10-3), as follows: "0" for file does not exist, "1" for file exists.

Related Commands: EXISTD?

EXW? Output multiple source sweep flag for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EXW?`

Data I/O: Outputs its value using ASCII <NR1> format (paragraph 10-3), as follows:. "0" for sweep, "1" for CW. See the commor's function group.

FCW0 Turn fast CW measurement mode off **FAST CW (Ch 7)**

Syntax: `FCW0`

Remarks: The instrument will return to the normal measurement and display mode.

Related Commands: FCW1, FCWX?

FCW1 Turn fast CW measurement mode on **FAST CW (Ch 7)**

Syntax: `FCW1`

Remarks: The instrument display is not updated. Raw data from the active channel is made available to the GPIB bus or collected in an internal buffer.

Data I/O: If internal buffer data collection is not active, the raw data measurement is output as an <Arbitrary Block> (paragraph 10-3). The format is always FMC. The most current data measurement is returned.

Block Size: The data consists of a pair of 4-byte floating point numbers (real and imaginary) for a total of 8 bytes.

Related Commands: FCW0, FCWX?, TEX, TIB

FCW2 Turn Fast CW mode 2 on **FAST CW (Ch 7)**

Syntax: `FCW2`

Remarks: The instrument display is not updated. Raw data from the measurement task is made available to the GPIB bus or collected in an internal buffer.

Data I/O: If internal buffer data collection is not active, the raw data measurement is output as an <Arbitrary Block>.

Block Size: The data consists of 3 complex measurements. Each measurement consists of a pair of 4-byte floating point numbers (real and imaginary). This gives a total of 24 bytes.

Related Commands: FCW0, FCW1, FCWX?, TEX, TIB

FCWX? Output fast CW measurement mode on/off status **FAST CW (Ch 7)**

Syntax: `FCWX?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0" for OFF, "1" for ON.

Related Commands: FCW0, FCW1

FDH0 Select variable length arbitrary block headers **TRANSMISSION METHODS (Ch 7)**

Syntax: `FDH0`

Remarks: This is the default mode.

Related Commands: FDH1, FDH2, FDHX?

FDH1 Select fixed length arbitrary block headers **TRANSMISSION METHODS (Ch 7)**

Syntax: FDH1

Remarks: The block size portion of the arbitrary block header will be padded with leading zeros as necessary to cause the overall length to be 11. For example, the fixed length header shown below would precede a data block containings 123 bytes: #9000000123

Related Commands: FDH0, FDH2, FDHX?

FDH2 Select zero length arbitrary block headers **TRANSMISSION METHODS (Ch 7)**

Syntax: FDH2

Remarks: Reverts to the FDH1 mode after completion of the current program message.

Related Commands: FDH0, FDH1, FDHX?

FDHX? Output arbitrary block header length selection **TRANSMISSION METHODS (Ch 7)**

Syntax: FDHX?

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0" for variable length arbitrary block headers, "1" for fixed length arbitrary block headers, "2" for no arbitrary block headers.

Related Commands: FDH0, FDH1, FDH2

FFD Send form feed to printer and stop print/plot **HARD COPY (Ch 8)**

Syntax: FFD

FGT Select frequency with time gate for active channel **TIME DOMAIN (Ch 9)**

Syntax: FGT

Remarks: Selects frequency with time gate mode for active channel.

Related Commands: CH1-CH4, OPC

FHI Set data points to 1601 **MEASUREMENT (Ch 4)**

Syntax: FHI

Related Commands: WFS, OPC, NP1601, FME, FLO

FIL Fill defined discrete frequency range **MEASUREMENT (Ch 4)**

Syntax: FIL

Remarks: See the command' s function group.

FLC Source frequency linearity internal calibration **DIAGNOSTICS (Ch 8)**

Syntax: FLC

Remarks: For service use only.

FLO Set data points to 101 **MEASUREMENT (Ch 4)**

Syntax: FLO

Related Commands: WFS, OPC, NP101, FME, FHI

FLTBW? Output filter bandwidth **MARKERS (Ch 6)**

Syntax: FLTBW?

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: BWL3, BWLS,

FLTC? Output filter center frequency **MARKERS (Ch 6)**

Syntax: FLTC?

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: BWL3, BWLS

FLTL? Output filter loss at reference value **MARKERS (Ch 6)**

Syntax: FLTL?

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: MSR0, MSRD, MSRM

FLTQ? Output filter Q **MARKERS (Ch 6)**

Syntax: `FLTQ?`

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: DSQ0, DSQ1

FLTS? Output filter shape factor **MARKERS (Ch 6)**

Syntax: `FLTS?`

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: DSF0, DSF1

FMA Select ASCII data transfer format **DATA TRANSFER (Ch 7)**

Syntax: `FMA`

Remarks: Selects ASCII <NR3> as appropiate for succeeding data transfer commands. The ASCII format will stay in effect until either the FMB or FMC (binary format) commands are issued. This command will have no effect on data transfer commands that cannot be output in ASCII format. See the specific command's description to determine formats supported.

Related Commands: FMB, FMC

FMB Select IEEE754 64 bit data transfer format **DATA TRANSFER (Ch 7)**

Syntax: `FMB`

Remarks: Selects IEEE-754 64-bit (double precision, 8 bytes) binary data transfer format for succeeding data transfer commands. The 64-bit format will stay in effect until either the FMA (ASCII) or FMC (32-bit binary) commands are issued.

This command will have no effect on data transfer commands that cannot be output in 64-bit format. See the specific command's description to determine formats supported.

Related Commands: FMA, FMC, LSB, MSB

FMC Select IEEE754 32 bit data transfer format **DATA TRANSFER (Ch 7)**

Syntax: FMC

Remarks: Selects IEEE-754 32-bit (single precision, 4 bytes) binary data transfer format for succeeding data transfer commands. The 32-bit format will stay in effect until either the FMA (ASCII) or FMB (64-bit binary) commands are issued.

This command will have no effect on data transfer commands that cannot be output in 32-bit format. See the specific command's description to determine formats supported.

Related Commands: FMA, FMB, LSB, MSB

FME Set data points to 401 **MEASUREMENT (Ch 4)**

Syntax: FME

Related Commands: WFS, OPC, NP401, FHI, FLO

FMKR Select filter parameters marker mode **MARKERS (Ch 6)**

Syntax: FMKR

Related Commands: AMKR, NMKR, SMKR, XMKR?

FMT0 Select normal ascii data element delimiting **TRANSMISSION METHODS (Ch 7)**

Syntax: FMT0

Remarks: When data values are output with the FMA mode, each value is separated with a comma. This is also true for listing type outputs such as for the service log or disk directory. This is the default mode.

Related Commands: FMT1, FMTX?, FMA

FMT1 Select enhanced ascii data element delimiting **TRANSMISSION METHODS (Ch 7)**

Syntax: FMT1

Remarks: When data values are output with the FMA mode, each data pair is separated with a line feed. Each element within the pair is separated with a comma. If there is no data pair, each element is separated with a line feed. Each line in the service log listing or the disk directory listing is separated with a line feed.

Related Commands: FMT0, FMTX?, FMA

FMTX? Output ascii data element delimiting mode **TRANSMISSION METHODS (Ch 7)**

Syntax: `FMTX?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0" for normal delimiting, "1" for enhanced delimiting.

Related Commands: FMT0, FMT1, FMA

FMX? Output data output mode FMA FMB or FMC **DATA TRANSFER (Ch 7)**

Syntax: `FMX?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0" for FMA, "1" for FMB, "2" for FMC.

Related Commands: FMA, FMB, FMC

FOF Blank frequency information **SYSTEM STATE (Ch 8)**

Syntax: `FOF`

Remarks: Blanks any frequency information from the screen and any hard copy output. This command is useful for security reasons since the instrument cannot display frequency data again without the FON command being issued or a reset is invoked.

Related Commands: FON

FON Display frequency information **SYSTEM STATE (Ch 8)**

Syntax: `FON`

Remarks: See FOF for more information.

Related Commands: FOF

FOX? Output frequency information on/off status — **SYSTEM STATE (Ch 8)**

Syntax: FOX?

Data I/O: Outputs its value in ASCII <NR1 > format (paragraph 10-3), as follows: "0" for OFF or "1" for ON.

FP0 Turn flat power correction off — **MEASUREMENT (Ch 4)**

Syntax: FP0

FP1 Turn flat power correction on — **MEASUREMENT (Ch 4)**

Syntax: FP1

FPT Select front panel keypad testing — **PERIPHERAL TESTS (Ch 8)**

Syntax: FPT

Remarks: For service use only.

FPX? Output flat power correction on/off status — **DIAGNOSTICS (Ch 8)**

Syntax: FPX?

Remarks: For service use only.

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3), as follows: "0" for OFF or "1" for ON.

FQD Select frequency domain for active channel — **TIME DOMAIN (Ch 9)**

Syntax: FQD

Related Commands: WFS, OPC

FRC Clear all defined discrete frequency ranges — **MEASUREMENT (Ch 4)**

Syntax: FRC

Remarks: See command's function group.

FRI Enter Discrete Fill increment frequency — **MEASUREMENT (Ch 4)**

Syntax: `FRI val1 unit(s)`
Val 1: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Val1 must be within 37XXX start- and stop-sweep frequencies. See the command's function group.

FRP Enter Discrete Fill number of points **MEASUREMENT (Ch 4)**

Syntax: `FRP val1 unit(s)`
Val 1: 1 to current number of points, 1601 max
Units: XX1, XX3, XM3

Remarks: See command's function group.

FRS Enter Discrete Fill start frequency **MEASUREMENT (Ch 4)**

Syntax: `FRS val1 unit(s)`
Val 1: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Val1 must be within 37XXX start- and stop-sweep frequencies. See the command's function group.

GCMP Enter gain compression point search value **GAIN COMPRESSION (Ch 9)**

Syntax: `GCMP val1 unit(s)`
Val 1: Number
Units: DB

Remarks: To search for the 1 dB gain compression point, enter a search value of 1 dB.

Data I/O: Enter the search value in ASCII <NRF> format (paragraph 10-3).

Related Commands: SPGCA, GCMP?

GCMP? Output gain compression point search value **GAIN COMPRESSION (Ch 9)**

Syntax: `GCMP?`

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: SPGCA, GCMP

GCT Enter gate center value distance or time **TIME DOMAIN (Ch 9)**

Syntax: `GCT val1 unit(s)`
Val 1: -999.999 to 999.999 ms,
Units: time = S, MS, USC, PS, PSC, NS, NSC; distance = M, MTR, MM, MMT, CM, CMT

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?

GCT? Output gate center value **TIME DOMAIN (Ch 9)**

Syntax: `GCT?`

Data I/O: Outputs value in ASCII <NR3> format.

Related Commands: GCT

GDS Gate symbols displayed on active channel **TIME DOMAIN (Ch 9)**

Syntax: `GDS`

GHZ Suffix sets frequency data type and scales by 1E9 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `GHZ`

GLS Select low sidelobe gate shape **TIME DOMAIN (Ch 9)**

Syntax: `GLS`

GMS Select minimum sidelobe gate shape **TIME DOMAIN (Ch 9)**

Syntax: GMS

GNM Select nominal gate shape **TIME DOMAIN (Ch 9)**

Syntax: GNM

GOF Turn off gating on active channel **TIME DOMAIN (Ch 9)**

Syntax: GOF

Related Commands: GOF?

GOF? Output gating mode on active channel **TIME DOMAIN (Ch 9)**

Syntax: GOF?

Data I/O: Outputs its value using ASCII <NR1> format, as follows: "0" for OFF, "1" for ON, "2" for display gate symbols.

Related Commands: GOF

GON Turn on gating on active channel **TIME DOMAIN (Ch 9)**

Syntax: GON

GPN Enter pen number for graticule **HARD COPY (Ch 8)**

Syntax: GPN val1 unit(s)
Val 1: 1 to 8
Units: XX1

GRF? Output graph type for active channel **DISPLAY (Ch 4)**

Syntax: GRF?

Data I/O: Outputs its value using ASCII <NR1> format (paragraph 10-3), as follows: "1" for log mag, "2" for phase, "3" for log mag & phase, "4" for Smith-impedance, "5" for SWR, 6 for group delay, "7" for Smith-admittance, "8" for lin polar, "9" for log polar, "0" for lin mag, "11" for lin mag & phase, "12" for real, "13" for imaginary, "14" for real & imaginary, "15" for power out.

GRT Select Rectangular gate shape **TIME DOMAIN (Ch 9)**

Syntax: GRT

GRTCOL Enter the color number for the graticule **SYSTEM STATE (Ch 8)**

Syntax: GRTCOL val1
Val 1: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Related Commands: ANNCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, GRTCOL?

GRTCOL? Output the color number for the graticule **SYSTEM STATE (Ch 8)**

Syntax: GRTCOL?

Data I/O: Outputs the color palette numbers in ASCII <NR1> format.

Related Commands: ANNCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, GRTCOL

GSN Enter gate span value distance or time **TIME DOMAIN (Ch 9)**

Syntax: GSN val1 unit(s)
Val 1: 0.0000 to 999.999 ms
Units: time = S, MS, USC, PS, PSC, NS, NSC; distance = M, MTR, MM, MMT, CM, CMT

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?

GSN? Output gate span value **TIME DOMAIN (Ch 9)**

Syntax: `GSN?`

Data I/O: Outputs its value using ASCII <NR3> format.

Related Commands: GSN

GSP Enter gate stop value distance or time **TIME DOMAIN (Ch 9)**

Syntax: `GSP val1 unit(s)`
Val 1: -99.9999 to +999.9999 ms
Units: S, MS, USC, PS, PSC, NS, NSC

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, GSP?

GSP? Output gate stop value **TIME DOMAIN (Ch 9)**

Syntax: `GSP?`

Data I/O: Outputs value using ASCII <NR3> format.

Related Commands: GSP

GST Enter gate start value distance or time **TIME DOMAIN (Ch 9)**

Syntax: `GST val1 unit(s)`
Val 1: -99.9999 to +999.9999 ms
Units: S, MS, USC, PS, PSC, NS, NSC

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?

GST? Output gate start value — **TIME DOMAIN (Ch 9)**

Syntax: `GST?`

Data I/O: Outputs value using ASCII <NR3> format.

Related Commands: GST

GSX? Output gate shape — **TIME DOMAIN (Ch 9)**

Syntax: `GSX?`

Data I/O: Outputs its value using ASCII <NR1> format, as follows: "1" for rectangular, "2" for nominal, "3" for low sidelobe, "4" for minimum sidelobe.

Related Commands: GLS, GMS, GNM, GRT, GSX?

HC0 Disable internal IF calibration — **MEASUREMENT (Ch 4)**

Syntax: `HC0`

Remarks: Prevents VNA from periodically and automatically performing the internal calibration, to allow for synchronization between the 37XXX and a physical activity such as antenna rotation. Turn on IF Cal as soon as measurement is complete to retain maximum measurement accuracy.

Related Commands: HC1, HCX?, HCT

HC1 Enable internal IF calibration and trigger an IF calibration — **MEASUREMENT (Ch 4)**

Syntax: `HC1`

Related Commands: HC0, HCX?, HCT

HCT Trigger an IF calibration **MEASUREMENT (Ch 4)**

Syntax: `HCT`

Related Commands: HC0, HC1

HCX? Output internal IF calibration enable/disable status **MEASUREMENT (Ch 4)**

Syntax: `HCX?`

Data I/O: Outputs its value using ASCII <NR1> format (paragraph 10-3), as follows: "0" for disabled or "1" for enabled.

HD0 Turn off tabular data headers and page formatting **HARD COPY (Ch 8)**

Syntax: `HD0`

Remarks: Turns off the tabular data headers and page formatting from tabular data printing or disk saves.

Related Commands: HD1

HD1 Turn on tabular data headers and page formatting **HARD COPY (Ch 8)**

Syntax: `HD1`

Remarks: Turns on the tabular data headers and page formatting from tabular data printing or disk saves.

Related Commands: HD0

HID Hide active segmented limit **LIMITS (Ch 6)**

Syntax: `HID`

Related Commands: DIS, CH1-CH4

HLD Put sweep into hold mode **MEASUREMENT (Ch 4)**

Syntax: `HLD`

Related Commands: CTN, BH0, BH1, RH0, RH1

HLD? Output the sweep hold status **MEASUREMENT (Ch 4)**

Syntax: `HLD?`

Data I/O: Outputs its value using ASCII <NR1> format, as follows: "0" for not in hold or "1" for in hold.

Related Commands: HLD, CTN

HPN Enter pen number for header **HARD COPY (Ch 8)**

Syntax: `HPN val1 unit(s)`
Val 1: 1 to 8
Units: XX1

HZ Suffix sets frequency data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `HZ`

IARF Enter adapter removal files from GPIB and calibrate **ADAPTER REMOVAL (Ch 9)**

Syntax: `IARF val1, val2`

Remarks: val1 is the XX front panel and cal file data and val2 is the YY front panel and cal file data. See the Adapter Removal application for details.

Data I/O: Each of the blocks, val1 and val2 is in <Arbitrary Block> format (paragraph 10-3). Notice the comma separator.

Related Commands: OCD, DISKWR, LDARF

IC1 Enter calibration coefficient 1 **DATA TRANSFER (Ch 7)**

Syntax: `IC1 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibra-

tion Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC10 Enter calibration coefficient 10 **DATA TRANSFER (Ch 7)**

Syntax: `IC10 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC11 Enter calibration coefficient 11 **DATA TRANSFER (Ch 7)**

Syntax: `IC11 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC12 Enter calibration coefficient 12 **DATA TRANSFER (Ch 7)**

Syntax: `IC12 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC2 Input Calibration Coefficient 2 **CALIBRATION (Ch 5)**

Syntax: `IC2 val1`

x

1 - 12

Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 12), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC3 Enter calibration coefficient 3 **CALIBRATION (Ch 5)**

Syntax: `IC3 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC4 Enter calibration coefficient 4 **CALIBRATION (Ch 5)**

Syntax: `IC4 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC5 Enter calibration coefficient 5 **CALIBRATION (Ch 5)**

Syntax: `IC5 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation

with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC6 Enter calibration coefficient 6 **CALIBRATION (Ch 5)**

Syntax: `IC6 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC7 Enter calibration coefficient 7 **CALIBRATION (Ch 5)**

Syntax: `IC7 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC8 Enter calibration coefficient 8 **CALIBRATION (Ch 5)**

Syntax: `IC7 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC9 Enter calibration coefficient 9 **CALIBRATION (Ch 5)**

Syntax: `IC9 val1`
Val 1: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

ICA Enter calibration coefficient 10 **CALIBRATION (Ch 5)**

Syntax: `ICA val1`
Val 1: A, B, or C

Units: <Arbitrary Block>

Remarks: ICA, ICB, and ICC are equivalents of IC10, IC11, and IC12 comands respectively.

ICB Enter calibration coefficient 11 **CALIBRATION (Ch 5)**

Syntax: `ICB val1`
Val 1: Same as ICA
Units: Same as ICA

Remarks: Same as ICA

ICC Enter calibration coefficient 12 **CALIBRATION (Ch 5)**

Syntax: `ICC val1`
Val 1: Same as ICA
Units: Same as ICA

Remarks: Same as ICA.

ICD Enter corrected data for active channel parameter **CALIBRATION (Ch 5)**

Syntax: `ICD val1`
Val 1: <Arbitrary Block>

Remarks: Data correction is for normalization and electrical length and, if applicable, time domain. Place the 37XXX in hold (HLD) then issue the ICD command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (paragraph 10-3).

Related Commands: FMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

ICF Enter front panel setup and calibration data **CALIBRATION (Ch 5)**

Syntax: `ICF val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OCF command. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OCF, IFP

ICL Enter all applicable calibration coefficients for cal type **CALIBRATION (Ch 5)**

Syntax: `ICL val1`
Val 1: <Arbitrary Block>

Remarks: Enter all error correction coefficients applicable to the current calibration type; see Table 10-1 at the end of this chapter. Prior to entering error terms, set the calibration type simulation with the corresponding Axx series calibration command (see Calibration Group). After inputting the error coefficients, apply error coeficients to measurement data with the CON command.

Data I/O: An array of floating point values whose size is equal to the currently set number of data points. The ICL command inputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Related Commands: FMA, FMB, FMC, OCL, IC1-IC12, CON

IEM Enter extended status byte mask **STATUS BYTE (Ch 8)**

Syntax: `IEM val1`
Val 1: 0 - 32767

Remarks: Sets the bits of the Standard Event Status Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0.

Related Commands: OEM, OEB

IF1 Select 10 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF1`

IF2 Select 100 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF2`

IF3 Select 1 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF3`

IF4 Select 10 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF4`

IFA Select 30 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFA`

Remarks: Same as IF4.

IFB Select 1st IF bandpass testing **DIAGNOSTICS (Ch 8)**

Syntax: `IFB`

Remarks: For service use only.

IFD Enter final data for active channel parameter **CALIBRATION (Ch 5)**

Syntax: `IFD val1`
Val 1: <Arbitrary Block>

Remarks: Place the 37XXX in hold (HLD); then issue the IFD command. Data must match the current graph type as shown in Table 10-2 at the end of this chapter.

Data I/O: Inputs a floating point array whose size is equal to the number of points in the current sweep (the arrary size is doubled for dual graph displays, i.e. log mag/phase). The IFD command inputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Related Commands: ICD, OFD, FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, HLD, ONP, CH1-CH4

IFM Select 10 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFM`

Remarks: Same as IF1.

IFN Select 1 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFN`

Remarks: Same as IF3.

IFP Enter current front panel setup **MEASUREMENT (Ch 4)**

Syntax: `IFP val1`
Val 1: <Arbitrary Block>

Remarks: The VNA will validate then change to the new setup.

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OFP command. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OFP, ICF

IFR Select 100 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFR`

Remarks: Same as IF2.

IFV Enter frequency values **MEASUREMENT (Ch 4)**

Syntax: `IFV val1`
Val 1: <Arbitrary Block>

Remarks: Inputs a list of frequencies for use as current sweep or for calibration setup. NOTE: IFV will reset (delete) existing calibration sweep and data.

Data I/O: An array of from 2 to 1601 floating point values containing frequencies within the 37XXX range. The IFV command inputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Related Commands: FMA, FMB, FMC, LSB, MSB, DFC, ONP, WFS

IFX? Output IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFX?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for 10 Hz, "2" for 100 Hz, "3" for 1 kHz, or "4" for 10 kHz.

IHDW Enter hardware cal data from GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `IHDW val1`
Val 1: Val1 is the hardware calibration data previously output using the command OHDW

Data I/O: The data is expected in <Ararbitrary Block> format (paragraph 10-3). Notice that it is not necessary to specify the type of hardware cal data as this information is contained within the data itself.

Related Commands: OHDW, DISKWR, RECALL

IKIT Enter calkit data from GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `IKIT "type", val1`
Val 1: Type is a three-letter string which indicates the type of calibration kit data file. val1 is the actual calibration kit data. Notice the comma separator.

Remarks: Calibration kit data files can be found on the data floppy disks that come with the calibration kits. The type string is the 3 character extention of the data file.

Data I/O: The data, val1 is encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Related Commands: LKT, DISKWR, RECALL

ILM Enter limits status byte mask **STATUS BYTE (Ch 7)**

Syntax: `ILM val1`
Val 1: 0-255

Remarks: Sets the bits of the Standard Event Status Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0 NOTE: The Limits Testing feature must be turned on (LT1) for the 37XXX to report a limits pass/fail status.

Related Commands: OLM, OLB, LT1

IMG Select imaginary display for active channel **DISPLAY (Ch 4)**

Syntax: `IMG`

Related Commands: DLA, CH1-CH4, ISC, ISE, ISM, IMG, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

IMU Suffix sets imaginary data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `IMG`

INRM Enter normalization data from GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `INRM val1`
Val 1: Val1 is the normalization data encapsulated in an <Arbitrary Block> format (paragraph 10-3)

Remarks: The normalization data is that which was gotten previously by reading a normalization data file (*.NRM) or by using the command ONRM.

Related Commands: ONRM, DISKWR, RECALL

INT Initialize (format) floppy disk **DISK FUNCTION (Ch 8)**

Syntax: `INT`

Remarks: Initializes (formats) floppy disk in floppy drive to IBM/DOS 1.44 MB format. Command can take up to five minutes to complete format. NOTE: All data on floppy disk will be erased immediately upon execution of this command.

Related Commands: *OPC, *OPC?

IPM Enter the 488.2 Service Request Enable mask **STATUS BYTE (Ch 7)**

Syntax: `IPM val1`
Val 1: 0-55

Remarks: Behaves exactly the same as the *SRE, 488.2 common command. It sets the bits of the Service Request Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0. Note that the Master Summary Status (MSS) bit 6 (decimal 64) will be ignored

since it represents the summary of all enabled status bits (bits 0-5, 7). This command is same as *SRE.

IS1 Enter front panel setup 1 **MEASUREMENT (Ch 4)**

Syntax: `IS1 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS10 Enter front panel setup 10 **MEASUREMENT (Ch 4)**

Syntax: `IS10 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS2 Enter front panel setup 2 **MEASUREMENT (Ch 4)**

Syntax: `IS2 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS3 Enter front panel setup 3 **MEASUREMENT (Ch 4)**

Syntax: `IS3 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal

system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS4 Enter front panel setup 4 **MEASUREMENT (Ch 4)**

Syntax: `IS4 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS5 Enter front panel setup 5 **MEASUREMENT (Ch 4)**

Syntax: `IS5 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS6 Enter front panel setup 6 **MEASUREMENT (Ch 4)**

Syntax: `IS6 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS7 Enter front panel setup 7 **MEASUREMENT (Ch 4)**

Syntax: `IS7 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS8 Enter front panel setup 8 **MEASUREMENT (Ch 4)**

Syntax: `IS8 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS9 Enter front panel setup 9 **MEASUREMENT (Ch 4)**

Syntax: `IS9 val1`
Val 1: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

ISC Enter scale and select inverted compressed Smith Chart display **DISPLAY (Ch 4)**

Syntax: `ISC val1 unit(s)`
Val 1: 3
Units: DBL, XX1

Related Commands: DLA, CH1-CH4, IMG, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

ISE Enter scale and select inverted expanded Smith Chart display **DISPLAY (Ch 4)**

Syntax: `ISE val1 unit(s)`
Val 1: 10, 20, 30
Units: DBL, XX1

Related Commands: DLA, CH1-CH4, IMG, ISC, ISM, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

ISF Exclude isolation **CALIBRATION (Ch 5)**

Syntax: `ISF`

Related Commands: ISN, C12, C8T, C8R

ISM Select normal inverted Smith Chart for active channel **DISPLAY (Ch 4)**

Syntax: `ISM`

Related Commands: DLA, CH1-CH4, ISC, ISE, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

ISN Include isolation **CALIBRATION (Ch 5)**

Syntax: `ISN`

KEC Keep existing calibration data **CALIBRATION (Ch 5)**

Syntax: `KEC`

KHZ Suffix sets frequency data type and scales by 1E3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `KHZ`

L1C Perform LO1 internal calibration **CALIBRATION (Ch 5)**

Syntax: `L1C`

Related Commands: ALC,SFC,L2C,SLT

L2C Perform LO2 internal calibration **CALIBRATION (Ch 5)**

Syntax: `L2C`

Related Commands: ALC,SFC,L1C,SLT

LA1 Select a1 = Ra as phase lock for parameter being defined — **MEASUREMENT (Ch 4)**

Syntax: `LA1`

Related Commands: LA2,LAX?

LA2 Select a2 = Rb as phase lock for parameter being defined — **MEASUREMENT (Ch 4)**

Syntax: `LA2`

Related Commands: LA1,LAX?

LAND Select landscape mode for output plot — **HARD COPY (Ch 8)**

Syntax: `LAND`

Related Commands: PORT

LAX? Output phase lock selection for parameter being defined — **MEASUREMENT (Ch 4)**

Syntax: `LAX?`

Data I/O: Outputs data using ASCII <NR1> format (paragraph 10-3): "1" for A1 or "2" for A2.

Related Commands: LA1,LA2

LAYCOL Enter the color number for overlay data — **SYSTEM STATE (Ch 8)**

Syntax: `LAYCOL val1`
Val 1: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Related Commands: ANNCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, LAYCOL?

LAYCOL? Output the color number for overlay data — **SYSTEM STATE (Ch 8)**

Syntax: `LAYCOL?`

Data I/O: Outputs the color palette number using ASCII <NR1> format (paragraph 10-3).

Related Commands: DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, LAYCOL

LB0 Turn limits testing beep on failure off **LIMITS (Ch 6)**

Syntax: `LB0`

Related Commands: LB0, LT0, LBX?

LB1 Turn limits testing beep on failure on **LIMITS (Ch 6)**

Syntax: `LB1`

Remarks: Issues an audible beep if a set limit is exceeded.

Related Commands: LB0, LT0, LBX?

LBX? Output limits testing beeper enable status **LIMITS (Ch 6)**

Syntax: `LBX?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for disabled or "1" for enabled.

LCM Select LRL calibration method **CALIBRATION (Ch 5)**

Syntax: `LCM`

Related Commands: SCM, OCM

LDARF Load adapter removal files from disk and calibrate **DISK FUNCTION (Ch 8)**

Syntax: `LDARF "filespecxx", "filespecyy"`

Remarks: "filespecxx" is the filename and path to the XX front panel and calibration file. "filespecyy" is the filename and path to the YY front panel and cal file. Refer to the adapter removal description for more details. Notice the comma separator.

LDT0 Disable printing date/time **HARD COPY (Ch 8)**

Syntax: `LDT0`

Related Commands: LDT1

LDT1 Enable printing date/time **HARD COPY (Ch 8)**

Syntax: `LDT1`

Related Commands: LDT0

LFD Enter limit frequency readout delta value **LIMITS (Ch 6)**

Syntax: `LFD val1 unit(s)`
Val 1: Depends on graph type
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Remarks: Enter the value to offset Limit 2 from the currently set value of Limit 1. Both limits must be on to use this command. The values and suffixes are as appropriate for the graph type displayed.

Related Commands: LFP, CH1-CH4, LFD?

LFD2 Enter limit frequency readout delta value for bottom graph **LIMITS (Ch 6)**

Syntax: `LFD2 val1 unit(s)`
Val 1: Depends on graph type
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Remarks: Enter the value to offset Limit 2 from the currently set value of Limit 1. Both limits must be on to use this command. The values and suffixes are as appropriate for the graph type displayed.

Related Commands: LFP, CH1-CH4, LFD2?

LFD2? Output limit frequency readout delta value for bottom graph **LIMITS (Ch 6)**

Syntax: `LFD2?`

Data I/O: Outputs its value in ASCII <NR3> format (paragraph 10-3).

Related Commands: LFD2

LFD? Output limit frequency readout delta value — **LIMITS (Ch 6)**

Syntax: `LFD?`

Data I/O: Outputs its value in ASCII <NR3> format (paragraph 10-3).

Related Commands: LFD

LFP Select limit frequency readout for phase displays — **LIMITS (Ch 6)**

Syntax: `LFP`

Remarks: Phase displays, which appears on a dual graph type like log magnitude and phase, are set using this command.

Related Commands: LFD, CH1-CH4

LFR Select limit frequency readout for active channel — **LIMITS (Ch 6)**

Syntax: `LFR`

Related Commands: LFD, LFP

LID Enter string for DUT identity — **MISCELLANEOUS (Ch 7)**

Syntax: `LID "val1"`
Val 1: String of up to 15 valid characters.

Related Commands: LDT, LMS, LNM. LID?

LID? Output string for DUT identity — **MISCELLANEOUS (Ch 7)**

Syntax: `LID?`

Data I/O: Outputs its string in <Arbitrary ASCII> format (paragraph 10-3).

Related Commands: LID

LIN Select linear magnitude display for active channel — **DISPLAY (Ch 4)**

Syntax: `LIN`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

LKS0 Disable lock search mode **DIAGNOSTICS (Ch 8)**

Syntax: `LKS0`

Remarks: For service use only.

LKS1 Enable lock search mode **DIAGNOSTICS (Ch 8)**

Syntax: `LKS1`

Remarks: For service use only.

LKT Load calibration kit information from floppy disk **DISK FUNCTION (Ch 8)**

Syntax: `LKT`

LL1 Enter length of line 1 for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LL1 val1 unit(s)`
Val 1: 0 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT, LL2

LL2 Enter length of line 2 for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LL2 val1 unit(s)`
Val 1: 0 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT

LL3 Enter length of line 3 for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LL3 val1 unit(s)`
Val 1: 0 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT

LLM? Output limit line display mode single or segmented **LIMITS (Ch 6)**

Syntax: `LLM?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for single or "1" for segmented.

LLO Enter lower limit value for top graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO`
Val 1: Depends on graph type (see DISPLAY group)
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: LUP, CH1-CH4

LLO2 Enter lower limit value for bottom graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO2 val1 unit(s)`
Val 1: Depends on graph type (see DISPLAY group)
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: LFD2, LOL20, LOL21, LUP2, UPL20, UPL21

LLO2? Output lower limit value for bottom graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO2?`

Data I/O: Outputs its value using ASCII <NR3 > format (paragraph 10-3).

Related Commands: LLO2

LLO? Output lower limit value for top graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO?`

Data I/O: Outputs its value using ASCII <NR3 > format (paragraph 10-3).

LLZ Enter line impedance for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LLZ val1 unit(s)`
Val 1: 0.001 to 1x10E+3
Units: XX1 XX3, XM3, OHM

LM2 Select a match for the second device during a LRM type calibration — **CALIBRATION (Ch 5)**

Syntax: `LM2`

LM3 Select a match for the third device during a LRM type calibration — **CALIBRATION (Ch 5)**

Syntax: `LM3`

LMS Enter string for DUT model/serial number — **HARD COPY (Ch 8)**

Syntax: `LMS?`

Related Commands: LMS

LMS? Output string for DUT model/serial number — **MISCELLANEOUS (Ch 7)**

Syntax: `LMS?`

Data I/O: Outputs string in <Arbitrary ASCII> format.

Related Commands: LMS

LNM Enter string for operator name — **MISCELLANEOUS (Ch 7)**

Syntax: `LNM "val1"`
Val 1: String up to 15 characters long

Related Commands: LID, LMS

LNM? Output string for operator name — **MISCELLANEOUS (Ch 7)**

Syntax: `LNM?`

Data I/O: Outputs its string in <Arbitrary ASCII> format (paragraph 10-3).

Related Commands: LNM

LO11 Select LO1 phase lock voltage testing — **DIAGNOSTICS (Ch 8)**

Syntax: `LO11`

Remarks: For service use only.

LO12 Select LO1 D/A voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO12`

Remarks: For service use only.

LO21 Select LO2 main phase lock voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO2 1`

Remarks: For service use only.

LO22 Select LO2 offset phase lock voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO2 2`

Remarks: For service use only.

LO23 Select LO2 DDS phase lock voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO2 3`

Remarks: For service use only.

LO24 Select LO2 main D/A voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO2 4`

Remarks: For service use only.

LO25 Select LO2 offset D/A voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO2 5`

Remarks: For service use only.

LOC Enter string for operator comment **HARD COPY (Ch 8)**

Syntax: `LOC "val1"`
Val 1: String up to 79 characters long

Related Commands: LID, LNM, LMS

LOC? Output string for operator comment **HARD COPY (Ch 8)**

Syntax: LOC?

Data I/O: Outputs string in <Arbitrary ASCII> format (paragraph 10-3).

Related Commands: LOC

LOF Limits display off **LIMITS (Ch 6)**

Syntax: LOF

Related Commands: LON

LOGO0 Turn hard copy logo off **HARD COPY (Ch 8)**

Syntax: LOGO0

Remarks: After mnemonic is issued, printer and plotter will not form the logo portion of the printout or plot.

Related Commands: LOGO1, LOGOX?

LOGO1 Turn hard copy logo on **HARD COPY (Ch 8)**

Syntax: LOGO1

Remarks: After mnemonic is issued, printer an plotter will form a logo when printing or plotting.

Related Commands: LOGO0, LOGOX?

LOGO? Output hard copy logo selection standard/user defined **HARD COPY (Ch 8)**

Syntax: LOGO?

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for standard Anritsu logo or "1" for user defined logo.

Related Commands: LOGOS, LOGOU

LOGOS Select standard hard copy logo — HARD COPY (Ch 8)

Syntax: LOGOS

Related Commands: LOGOU, LOGO?

LOGOU Select user defined hard copy logo — HARD COPY (Ch 8)

Syntax: LOGOU

Remarks: For the user-defined logo to function, the following files must be present in the C:\UTIL subdirectory: LOGO.EPS for epson type printers LOGO.HP for HP type printers and LOGO.PLT for plotters. If the required file is not found, the standard Anritsu logo will be used.

Related Commands: LOGOS, LOGO?

LOGOX? Output hard copy logo on/off status — HARD COPY (Ch 8)

Syntax: LOGOX?

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

Related Commands: LOGO0, LOGO1

LOL0 Turn lower limit off — LIMITS (Ch 6)

Syntax: LOL0

Related Commands: LON, LOF, LOL1, LLO

LOL1 Turn lower limit on at current value — LIMITS (Ch 6)

Syntax: LOL1

Related Commands: LON, LOF, LOL0, LLO

LOL20 Turn lower limit off for bottom graph — LIMITS (Ch 6)

Syntax: LOL20

Related Commands: LON, LOF, LOL21, LLO2

LOL21 Turn lower limit on at current value for bottom graph **LIMITS (Ch 6)**

Syntax: LOL21

Related Commands: LON, LOF, LOL20, LLO2

LOL2X? Output lower limit on/off status for bottom graph **LIMITS (Ch 6)**

Syntax: LOL2X?

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

Related Commands: LOL20, LOL21

LOLX? Output lower limit on/off status **LIMITS (Ch 6)**

Syntax: LOLX

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).(0 for OFF, 1 for ON).

LON Limits display on **LIMITS (Ch 6)**

Syntax: LON

LON? Output limits display on/off status **LIMITS (Ch 6)**

Syntax: LON?

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

LPF1? Output limit test failure status on channel 1 **LIMITS (Ch 6)**

Syntax: LPF1?

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

LPF2? Output limit test failure status on channel 2 **LIMITS (Ch 6)**

Syntax: LPF2?

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

LPF3? Output limit test failure status on channel 3 **LIMITS (Ch 6)**

Syntax: `LPF3?`

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

LPF4? Output limit test failure status on channel 4 **LIMITS (Ch 6)**

Syntax: `LPF4?`

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

LPF? Output limit test failure status all channels **LIMITS (Ch 6)**

Syntax: `LPF?`

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for logo off or "1" for logo on.

LPH Select linear magnitude and phase display for active channel **DISPLAY (Ch 4)**

Syntax: `LPH`

Related Commands: CH1-CH4

LPI Select lowpass impulse response for active channel **TIME DOMAIN (Ch 9)**

Syntax: `LPI`

Remarks: Requires a calibration that used a harmonically related set of data points - time domain calibration.

Related Commands: TDC, CH1-CH4

LPS Select lowpass step response for active channel **TIME DOMAIN (Ch 9)**

Syntax: `LPS`

Remarks: Requires a calibration that used a harmonically related set of data points - time domain calibration.

Related Commands: TDC, CH1-CH4

LPSX? Output lowpass response for active channel impulse or step **TIME DOMAIN (Ch 9)**

Syntax: `LPSX?`

Data I/O: Outputs its number using ASCII <NR1> format (paragraph 10-3) as follows: "0" for impulse or "1" for step.

LR2 Specify 2 line LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LR2`

LR3 Specify 3 line LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LR3`

LS1 Set lower segmented limit 100 as the active segment **LIMITS (Ch 6)**

Syntax: `LS1`

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US1-US10, CH1-CH4, LSX?

LS10 Select lower segmented limit 10 as the active segment **LIMITS (Ch 6)**

Syntax: `LS10`

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS2 Select lower segmented limit 2 as the active segment **LIMITS (Ch 6)**

Syntax: `LS2`

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS3 Select lower segmented limit 3 as the active segment **LIMITS (Ch 6)**

Syntax: LS3

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS4 Select lower segmented limit 4 as the active segment **LIMITS (Ch 6)**

Syntax: LS4

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS5 Select lower segmented limit 5 as the active segment **LIMITS (Ch 6)**

Syntax: LS5

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS6 Select lower segmented limit 6 as the active segment **LIMITS (Ch 6)**

Syntax: LS6

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS7 Select lower segmented limit 7 as the active segment **LIMITS (Ch 6)**

Syntax: LS7

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS8 Select lower segmented limit 8 as the active segment — **LIMITS (Ch 6)**

Syntax: LS8

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LS9 Select lower segmented limit 9 as the active segment — **LIMITS (Ch 6)**

Syntax: LS9

Remarks: All succeeding limit segment commands will apply to LSx.

Related Commands: US-US10, CH1-CH4, LSX?

LSB Select least significant byte first binary transfer — **DATA TRANSFER (Ch 7)**

Syntax: LSB

Remarks: This is convenient for transferring data into or out of IBM/Intel based computers.

Related Commands: MSB, FMB, FMC

LSEG Select segmented limit line display mode — **LIMITS (Ch 6)**

Syntax: LSEG

Remarks: Any segmented limit line command selects this mode automatically.

Related Commands: LSNG

LSNG Select single limit line display mode — **LIMITS (Ch 6)**

Syntax: LSNG

Remarks: Any single limit line command selects this mode automatically.

Related Commands: LSEG

LSX? Output active segmented limit — **LIMITS (Ch 6)**

Syntax: LSX?

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3). "1Ä10" for lower limit 1A10 or "100010" for upper limit 1Ä10.

LT0 Turn limits testing off **LIMITS (Ch 6)**

Syntax: LT0

LT1 Turn limits testing on **LIMITS (Ch 6)**

Syntax: LT1

Status Reporting: A limit test failure will set bits (0A3 for Channels 1A4, respectively) in the Limits Event Status Register.

LT1? Output limits testing enable status **LIMITS (Ch 6)**

Syntax: LT1?

LT1?

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3). "0" for OFF or "1" for ON.

LTC Select coaxial transmission line for calibration **CALIBRATION (Ch 5)**

Syntax: LTC

Remarks: Selects a coaxial transmission line for the calibration.

LTST Display the limits testing menu **LIMITS (Ch 6)**

Syntax: LTST

Related Commands: LT0, LT1

LTU Select microstrip transmission line for calibration **CALIBRATION (Ch 5)**

Syntax: LTU

LTW Select waveguide transmission line for calibration — **CALIBRATION (Ch 5)**

Syntax: `LTW`

Remarks: Can only use an offset short or CRL/LRM calibration method with waveguide calibration.

LTX? Output line type — **CALIBRATION (Ch 5)**

Syntax: `LTX?`

Data I/O: Outputs its value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for coax, "2" for waveguide or "3" for microstrip.

LUP Enter upper limit value for top graph on active channel — **LIMITS (Ch 6)**

Syntax: `LUP val1 unit(s)`
Val 1: Depends on graph type; see Table 11-2 at the end of this chapter.
Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Remarks: The values and suffixes are as appropriate for the graph type displayed. That is, DEG, dB, REU, etc.

Related Commands: LON, LOF, UPL0, UPL1

LUP2 Enter upper limit value for bottom graph on active channel — **LIMITS (Ch 6)**

Syntax: `LUP2 val1 unit(s)`
Val 1: Depends on graph type; see Table 11-2 at the end of this chapter.
Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Remarks: The values and suffixes are as appropriate for the graph type displayed. That is, DEG, dB, REU, etc.

Related Commands: LON, LOF, UPL20, UPL21

LUP2? Output upper limit value for bottom graph on active channel — **LIMITS (Ch 6)**

Syntax: `LUP2?`

Data I/O: Outputs its value in ASCII <NR3 > format (paragraph 10-3).

Related Commands: LUP2

LUP? Output upper limit value for top graph on active channel — **LIMITS (Ch 6)**

Syntax: `LUP?`

Data I/O: Outputs its value using ASCII <NR3 > format (paragraph 10-3).

LVH Select high as limits testing TTL level — **LIMITS (Ch 6)**

Syntax: `LVH`

Related Commands: LVL, LVX?

LVL Select low as limits testing TTL level — **LIMITS (Ch 6)**

Syntax: `LVL`

Related Commands: LVH, LVX?

LVX? Output limits testing ttl level status — **LIMITS (Ch 6)**

Syntax: `LVX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for low or "1" for high.

M Suffix sets distance data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `M`

Related Commands: MTR

M1C Set CW mode at marker 1 frequency — **MARKERS (Ch 6)**

Syntax: `M1C`

Remarks: Marker 1 must be set

Related Commands: MK1-MK12

M1E Set sweep/zoom end to marker 1 frequency distance or time — MARKERS (Ch 6)

Syntax: `M1E`

Remarks: Marker 1 must be set

Related Commands: MK1-MK12

M1S Set sweep/zoom start to marker 1 frequency distance or time — MARKERS (Ch 6)

Syntax: `M1S`

Remarks: Marker 1 must be set

Related Commands: MK1-MK12

M2C Set CW mode at marker 2 frequency — MARKERS (Ch 6)

Syntax: `M2C`

Remarks: Marker 2 must be set

Related Commands: MK1-MK12

M2E Set sweep/zoom end to marker 2 frequency distance or time — MARKERS (Ch 6)

Syntax: `M2E`

Remarks: Marker 2 must be set

Related Commands: MK1-MK12

M2S Set sweep/zoom start to marker 2 frequency distance or time — MARKERS (Ch 6)

Syntax: `M2S`

Remarks: Marker 2 must be set

Related Commands: MK1-MK12

M3C Set CW mode at marker 3 frequency — MARKERS (Ch 6)

Syntax: `M3C`

Remarks: Marker 3 must be set

Related Commands: MK1-MK12

M3E Set sweep/zoom end to marker 3 frequency distance or time — **MARKERS (Ch 6)**

Syntax: `M3E`

Remarks: Marker 3 must be set

Related Commands: MK1-MK12

M3S Set sweep/zoom start to marker 3 frequency distance or time — **MARKERS (Ch 6)**

Syntax: `M3S`

Remarks: Marker 3 must be set

Related Commands: MK1-MK12

M4C Set CW mode at marker 4 frequency — **MARKERS (Ch 6)**

Syntax: `M4C`

Remarks: Marker 4 must be set

Related Commands: MK1-MK12

M4E Set sweep/zoom end to marker 4 frequency distance or time — **MARKERS (Ch 6)**

Syntax: `M4E`

Remarks: Marker 4 must be set

Related Commands: MK1-MK12

M4S Set sweep/zoom start to marker 4 frequency distance or time — **MARKERS (Ch 6)**

Syntax: `M4S`

Remarks: Marker 4 must be set

Related Commands: MK1-MK12

M5C Set CW mode at marker 5 frequency **MARKERS (Ch 6)**

Syntax: `M5C`

Remarks: Marker 5 must be set

Related Commands: MK1-MK12

M5E Set sweep/zoom end to marker 5 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M5E`

Remarks: Marker 5 must be set

Related Commands: MK1-MK12

M5S Set sweep/zoom start to marker 5 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M5S`

Remarks: Marker 5 must be set

Related Commands: MK1-MK12

M6C Set CW mode at marker 6 frequency **MARKERS (Ch 6)**

Syntax: `M6C`

Remarks: Marker 6 must be set

Related Commands: MK1-MK12

M6E Set sweep/zoom end to marker 6 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M6E`

Remarks: Marker 6 must be set

Related Commands: MK1-MK12

M6S Set sweep/zoom start to marker 6 frequency distance or time — **MARKERS (Ch 6)**

Syntax: `M6S`

Remarks: Marker 6 must be set

Related Commands: MK1-MK12

MAG Select log magnitude display for active channel — **DISPLAY (Ch 4)**

Syntax: `MAG`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

MAT Select matched reflective devices during cal — **CALIBRATION (Ch 5)**

Syntax: `MAT`

Related Commands: MIX

MD Create a new disk directory — **DISK FUNCTION (Ch 8)**

Syntax: `MD "pathspec"`

Val 1: "pathspec" is a combination of letters, numbers, \ characters and underscores which spell out the path and name of the new directory

Remarks: Pathspec may include a drive letter of the form A: for the floppy disk or C: for the hard drive. Directory names follow the same rules as file names.

Related Commands: ADRIVE, CDRIVE, CD, MD

MEM Display trace memory on active channel — **DISPLAY (Ch 4)**

Syntax: `MEM`

Remarks: Store data from selected channel to memory (STD command), before using this command to view a trace with trace memory active.

Related Commands: STD, CH1-CH4

MFGCT Start multiple frequency swept power gain compression test — **GAIN COMPRESSION (Ch 9)**

Syntax: `MFGCT`

Remarks: Begins the automated sequence which collects and displays the multiple frequency swept power gain compression data.

Related Commands: SPGCA, SPGCT

MHZ Suffix sets frequency data type and scales by 1E6 — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MHZ`

MIN Select subtraction as trace math for active channel — **DISPLAY (Ch 4)**

Syntax: `MIN`

Related Commands: MUL, ADD, DIV, CH1-CH4, MTH?

MIX Select mixed reflective devices during calibration — **CALIBRATION (Ch 5)**

Syntax: `MIX`

Related Commands: MAT

MK1 Enter marker 1 frequency distance or time and turn on — **MARKERS (Ch 6)**

Syntax: `MK1 val1 unit(s)`
Val 1: Limited to current frequency, time, or distance sweep/zoom-range
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Related Commands: MR1-MR12

MK1? Output marker 1 frequency distance or time — **MARKERS (Ch 6)**

Syntax: `MK1?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Related Commands: OM1-OM12

MK2 Enter marker 2 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK2 val1 unit(s)`

Val 1: Limited to current frequency, time, or distance sweep/zoom-range

Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Related Commands: MR1-MR12

MK2? Output marker 2 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK2?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Related Commands: OM1-OM12

MK3 Enter marker 3 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK3 val1 unit(s)`

Val 1: Limited to current frequency, time, or distance sweep/zoom-range

Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Related Commands: MR1-MR12

MK3? Output marker 3 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK3?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Related Commands: OM1-OM12

MK4 Enter marker 4 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK4 val1 unit(s)`
Val 1: Limited to current frequency, time, or distance sweep/zoom-range
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Related Commands: MR1-MR12

MK4? Output marker 4 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK4?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Related Commands: OM1-OM12

MK5 Enter marker 5 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK5 val1 unit(s)`
Val 1: Limited to current frequency, time, or distance sweep/zoom-range
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Related Commands: MR1-MR12

MK5? Output marker 5 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK5?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Related Commands: OM1-OM12

MK6 Enter marker 6 frequency distance or time and turn on — **MARKERS (Ch 6)**

Syntax: `MK6 val1 unit(s)`
Val 1: Limited to current frequency, time, or distance sweep/zoom-range
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Related Commands: MR1-MR12

MK6? Output marker 6 frequency distance or time — **MARKERS (Ch 6)**

Syntax: `MK6?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Related Commands: OM1-OM12

MKRC Select interpolated marker functionality — **MARKERS (Ch 6)**

Syntax: `MKRC`

Related Commands: MKRD, MKRX?

MKRCOL Enter the color number for the markers — **SYSTEM STATE (Ch 8)**

Syntax: `MKRCOL val1`
Val 1: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MNUCOL, TRCCOL, MKRCOL?

MKRCOL? Output the color number for the markers — **SYSTEM STATE (Ch 8)**

Syntax: `MKRCOL?`

Data I/O: Outputs the color palette number in ASCII <NR1> format (paragraph 10-3).

Related Commands: ANNCOL?, DATCOL?, GRTCOL?, LAYCOL?, MNUCOL?, TRCCOL?, MKRCOL

MKRD Select discrete marker functionality **MARKERS (Ch 6)**

Syntax: `MKRD`

Related Commands: MKRC, MKRX?

MKRX? Output interpolated/discrete marker functionality **MARKERS (Ch 6)**

Syntax: `MKRX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: ."0" for Discrete or "1" for Interpolated.

Related Commands: MKRC, MKRD

MKSL Marker search left **MARKERS (Ch 6)**

Syntax: `MKSL (optional val1 unit(s))`
Val 1: Depends on graph type
Units: Depends on graph type

Remarks: If the optional val1 unit(s) argument is not supplied, the search marker (marker 2) is moved from its current position to the next most previous occurrence of the search value (see mnemonic SRCH). If the val1 unit(s) argument is supplied, the search value is updated to the argument value prior to moving the search marker.

Status Reporting: If the search fails to find the search value, the search failure bit (bit 4) in the Limits Event Status Register will be set. An Execution Error will also be reported.

Related Commands: MKSR, SMKR, SRCH, SRCH?

MKSR Marker search right **MARKERS (Ch 6)**

Syntax: `MKSR (optional val1 unit(s))`
Val 1: Depends on graph type
Units: Depend on graph type

Remarks: If the optional val1 unit(s) argument is not supplied, the search marker (marker 2) is moved from its current position to the next

occurance of the search value (see mnemonic SRCH). If the val1 unit(s) argument is supplied, the search value is updated to the argument value prior to moving the search marker.

Status Reporting: If the search fails to find the search value, the search failure bit (bit 4) in the Limits Event Status Register will be set. An Execution Error will also be reported.

Related Commands: MKSL, SMKR, SRCH, SRCH?

MKT0 Turn marker tracking off **MARKERS (Ch 6)**

Syntax: `MKT0`

Related Commands: MKT1, MKTX?

MKT1 Turn marker tracking on **MARKERS (Ch 6)**

Syntax: `MKT1`

Related Commands: MKT0, MKTX?

MKTX? Output marker tracking on/off status **MARKERS (Ch 6)**

Syntax: `MKTX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: MKT0, MKT1

MM Suffix sets distance data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MM`

MMBX? Output Millimeter Wave band selection **MILLIMETER WAVE (Ch 9)**

Syntax: `MMBX?`

Data I/O: Returns a value in ASCII <NR1> format (paragraph 10-3) as follows: (0=Q22,1=V15,2=E12,3=E12E,4=W10,5=W10E)

MMN Move active marker to minimum trace value **MARKERS (Ch 6)**

Syntax: MMN

Related Commands: MMX, CH1-CH4

MMT Suffix sets distance data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: MMT

Related Commands: MM

MMX Move active marker to maximum trace value **MARKERS (Ch 6)**

Syntax: MMX

Related Commands: MMN, CH1-CH4

MNUCOL Enter the color number for the menu headers **SYSTEM STATE (Ch 8)**

Syntax: MNUCOL val1
Val 1: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 (end of chapter).

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MKRCOL, TRCCOL, MNUCOL?

MNUCOL? Output the color number for the menu headers **SYSTEM STATE (Ch 8)**

Syntax: MNUCOL?

Data I/O: Outputs the color palette number in ASCII <NR1> format (paragraph 10-3).

Related Commands: ANNCOL?, DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, TRCCOL?, MNUCOL?

MO1 Turn off marker 1 **MARKERS (Ch 6)**

Syntax: MO1

MO2 Turn off marker 2 **MARKERS (Ch 6)**

Syntax: MO2

MO3 Turn off marker 3 **MARKERS (Ch 6)**

Syntax: `MO3`

MO4 Turn off marker 4 **MARKERS (Ch 6)**

Syntax: `MO4`

MO5 Turn off marker 5 **MARKERS (Ch 6)**

Syntax: `MO5`

MO6 Turn off marker 6 **MARKERS (Ch 6)**

Syntax: `MO6`

MOF Turn marker display off **MARKERS (Ch 6)**

Syntax: `MOF`

MON Turn marker display on **MARKERS (Ch 6)**

Syntax: `MON`

MON? Output marker display on/off status **MARKERS (Ch 6)**

Syntax: `MON?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

MPH Select log magnitude and phase display for active channel **DISPLAY (Ch 4)**

Syntax: `MPH`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

MPN Enter pen number for markers and limits **MISCELLANEOUS (Ch 7)**

Syntax: `MPN val1 unit(s)`

Val 1: 1 to 8
Units: XX1

MR1 Turn marker 1 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR1`

MR1? Output marker 1 on/off status **MARKERS (Ch 6)**

Syntax: `MR1?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: MR102, MO102

MR2 Turn marker 2 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR2`

MR2? Output marker 2 on/off status **MARKERS (Ch 6)**

Syntax: `MR2?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: MR102, MO102

MR3 Turn marker 3 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR3`

MR3? Output marker 3 on/off status **MARKERS (Ch 6)**

Syntax: `MR3?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: MR102, MO102

MR4 Turn marker 4 on and make it the active marker — MARKERS (Ch 6)

Syntax: `MR4`

MR4? Output marker 4 on/off status — MARKERS (Ch 6)

Syntax: `MR4?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: MR102, MO102

MR5 Turn marker 5 on and make it the active marker — MARKERS (Ch 6)

Syntax: `MR5`

MR5? Output marker 5 on/off status — MARKERS (Ch 6)

Syntax: `MR5?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: MR102, MO102

MR6 Turn marker 6 on and make it the active marker — MARKERS (Ch 6)

Syntax: `MR6`

MR6? Output marker 6 on/off status — MARKERS (Ch 6)

Syntax: `MR6?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: MR102, MO102

MRM Display the Marker Readout menu — MARKERS (Ch 6)

Syntax: `MRM`

Related Commands: LFP, LFR, LTST

MRR Restore original marker range **TIME DOMAIN (Ch 9)**

Syntax: `MRR`

Remarks: Valid only in the Time Domain mode.

MRX? Output active marker number **MARKERS (Ch 6)**

Syntax: `MRX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for No marker, "1" thru "6" for the marker number.

Related Commands: MR102

MS Suffix sets time data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MS`

MS0 Turn multiple source mode off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `MS0`

Related Commands: MS1, MSD

MS1 Turn multiple source mode on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `MS1`

Related Commands: MS0, MSD

MSB Select most significant byte first binary transfer **DATA TRANSFER (Ch 7)**

Syntax: `MSB`

Remarks: Default format for byte ordering — not suitable for IBM/Intel based computers.

Related Commands: LSB

MSD Select multiple source define mode **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `MSD`

Related Commands: MS0, MS1

MSFH Enter high loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFH val1 unit(s)`
Val 1: Depends on graph type; refer to Table 11-2 at the end of this chapter.
Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Related Commands: MSFL, MSFH?, FLTS?, DSF0, DSF1

MSFH? Output high loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFH?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

Related Commands: MSFH

MSFL Enter low loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFL val1 unit(s)`
Val 1: Depends on graph type; refer to Table 11-2 at the end of this chapter.
Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Related Commands: MSFH, MSFL?, FLTS?, DSF0, DSF1

MSFL? Output low loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFL?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

Related Commands: MSFL

MSR0 Select 0 as reference for marker search and bandwidth calculation — **MARKERS (Ch 6)**

Syntax: `MSR0`

Related Commands: MSRD, MSRM, MSRX?

MSRD Select delta reference marker as reference for marker search and bandwidth calculation — **MARKERS (Ch 6)**

Syntax: `MSRD`

Related Commands: MSR0, MSRM, MSRX?

MSRM Select maximum as reference for marker search and bandwidth calculation — **MARKERS (Ch 6)**

Syntax: `MSRM`

Related Commands: MSR0, MSRD, MSRX?

MSRX? Output reference selection for marker search and bandwidth calculation — **MARKERS (Ch 6)**

Syntax: `MSRX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for Zero dB, "1" for Delta Ref Mrkr,"2" for Maximum value.

Related Commands: MSR0, MSRD, MSRM

MSX? Output multiple source mode on/off/define — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `MSX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows:."0" for OFF, "1" for ON, "2" for DEFINE.

MTH? Output trace math math type — **DISPLAY (Ch 4)**

Syntax: `MTH?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for add, "2" for substract, "3" for multiply, "4" for divide.

Related Commands: ADD, DIV, MUL, MIN, DAT?

MTR Suffix sets distance data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MTR`

Related Commands: M

MUL Select multiplication as trace math for active channel **DISPLAY (Ch 4)**

Syntax: `MUL`

Related Commands: DIV, ADD, MIN, MTH?, CH1-CH4

MV Suffix sets voltage data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MV`

NA1 Select a1 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `NA1`

Related Commands: NA2, NB1, NB2, NU1, NUM?

NA2 Select a2 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `NA2`

Related Commands: NA1, NB1, NB2, NU1, NUM?

NB1 Select b1 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `NB1`

Related Commands: NA1, NA2, NB2, NU1, NUM?

NB2 Select b2 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `NB2`

Related Commands: NA1, NA2, NB1, NU1, NUM?

NCS Go to next calibration step **CALIBRATION (Ch 5)**

Syntax: `NCS`

Related Commands: OPC, TCD, TC1, TC2

NMKR Select normal markers on active channel marker mode **MARKERS (Ch 6)**

Syntax: `NMKR`

Related Commands: AMKR, FMKR, SMKR, XMKR?

NOC Select normal calibration data points **CALIBRATION (Ch 5)**

Syntax: `NOC`

Related Commands: SRT, STP, TOC, DFC, CWC

NOFST Enter nominal offset value for external gain **GAIN COMPRESSION (Ch 9)**

Syntax: `NOFST val1 unit(s)`
Val 1: The nominal offset value in ASCII <NRF> format (paragraph 10-3)
Units: DB

Remarks: This is the gain in the external path between port 1 and the AUT.

Related Commands: SFGCA, SPGCA, NOFST?

NOFST? Output nominal offset value for external gain **GAIN COMPRESSION (Ch 9)**

Syntax: `NOFST?`

Data I/O: The value is output in ASCII <NR3> format (paragraph 10-3).

Related Commands: SFGCA, SPGCA, NOFST

NP101 Set data points to 101 **MEASUREMENT (Ch 4)**

Syntax: `NP101`

Remarks: Restarts the sweep.

Related Commands: NPx series, WFS, *OPC, *OPC?, FLO

NP1601 Set data points to 1601 **MEASUREMENT (Ch 4)**

Syntax: `NP1601`

Remarks: Restarts the sweep.

Related Commands: NPx series, WFS, *OPC, *OPC?, FHI, ONP

NP201 Set data points to 201 **MEASUREMENT (Ch 4)**

Syntax: `NP201`

Remarks: Restarts the sweep.

Related Commands: NPx series, WFS, *OPC, *OPC?, ONP

NP401 Set data points to 401 **MEASUREMENT (Ch 4)**

Syntax: `NP401`

Remarks: Restarts the sweep.

Related Commands: NPx series, WFS, *OPC, *OPC?, FME, ONP

NP51 Set data points to 51 **MEASUREMENT (Ch 4)**

Syntax: `NP51`

Remarks: Restarts the sweep.

Related Commands: NPx series, WFS, *OPC, *OPC?, ONP

NP801 Set data points to 801 **MEASUREMENT (Ch 4)**

Syntax: `NP801`

Remarks: Restarts the sweep.

Related Commands: NPx series, WFS, *OPC, *OPC?, ONP

NRD Display non-ratioed parameters on 4 channels **DIAGNOSTICS (Ch 8)**

Syntax: NRD

Remarks: For service use only.

NRMS Normalize S21 for gain compression testing **GAIN COMPRESSION (Ch 9)**

Syntax: NRMS

Remarks: An S21 normalization is one of the required steps in both swept frequency and swept power gain compression testing.

Related Commands: SFGCA, SPGCA, CALR, UNDOGC

NS Suffix sets time data type and scales by 1E-9 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: NS

Related Commands: NSC

NSC Suffix sets time data type and scales by 1E-9 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: NSC

Related Commands: NS

NU1 Select unity as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: NU1

Related Commands: NA1, NA2, NB1, NB2, NUM?

NUM? Output numerator selection for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: NUM?

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for unity, "2" for a1, "3" for a2, "4" for b1, "5" for b2.

Related Commands: NA1, NA2, NB1, NB2, NU1

OAM1 Output channel 1 active marker value **DATA TRANSFER (Ch 7)**

Syntax: OAM1

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: OM1 thru OM6, OAM2, OAM3, OAM4

OAM2 Output channel 2 active marker value **DATA TRANSFER (Ch 7)**

Syntax: OAM2

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: OM1 thru OM6, OAM1, OAM3, OAM4

OAM3 Output channel 3 active marker value **DATA TRANSFER (Ch 7)**

Syntax: OAM3

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: OM1 thru OM6, OAM1, OAM2, OAM4

OAM4 Output channel 4 active marker value **DATA TRANSFER (Ch 7)**

Syntax: OAM4

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: OM1 thru OM6, OAM1, OAM2, OAM3

OBMP Output the display as a bitmap **HARD COPY (Ch 8)**

Syntax: `OBMP`

Data I/O: Bit map is output with an <Arbitrary Block> format (paragraph 10-3).

Block Size: 38470 bytes for a black on white bitmap, 307455 bytes for a color on white or true color bitmap

Related Commands: BMPB,BMPC, BMPT, SAVE

OC1 Output calibration coefficients 1 **DATA TRANSFER (Ch 7)**

Syntax: `OC1`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC10 Output calibration coefficients 10 **DATA TRANSFER (Ch 7)**

Syntax: `OC10`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary format-

ted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC11 Output calibration coefficients 11 **DATA TRANSFER (Ch 7)**

Syntax: `OC11`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC12 Output calibration coefficients 12 **DATA TRANSFER (Ch 7)**

Syntax: `OC12`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC2 Output calibration coefficients 2 **DATA TRANSFER (Ch 7)**

Syntax: `OC2`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC3 Output calibration coefficients 3 **DATA TRANSFER (Ch 7)**

Syntax: OC3

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC4 Output calibration coefficients 4 **DATA TRANSFER (Ch 7)**

Syntax: OC4

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC5 Output calibration coefficients 5 **DATA TRANSFER (Ch 7)**

Syntax: OC5

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC6 Output calibration coefficients 6 **DATA TRANSFER (Ch 7)**

Syntax: OC6

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC7 Output calibration coefficients 7 **DATA TRANSFER (Ch 7)**

Syntax: OC7

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output

an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC8 Output calibration coefficients 8 **DATA TRANSFER (Ch 7)**

Syntax: OC8

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC9 Output calibration coefficients 9 **DATA TRANSFER (Ch 7)**

Syntax: OC9

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OCA Output calibration coefficient A **DATA TRANSFER (Ch 7)**

Syntax: OCA

Remarks: The OCA, OCB, and OCC are equivalents of OC10, OC11, and OC12 respectively.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE 4 FMC MODE

OCB Output calibration coefficient B **DATA TRANSFER (Ch 7)**

Syntax: OCB

Remarks: The OCA, OCB, and OCC are equivalents of OC10, OC11, and OC12 respectively.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE 4 FMC MODE

OCC Output calibration coefficient C **DATA TRANSFER (Ch 7)**

Syntax: OCC

Remarks: The OCA, OCB, and OCC are equivalents of OC10, OC11, and OC12 respectively.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE 4 FMC MODE

OCD Output corrected data for active channel parameter **DATA TRANSFER (Ch 7)**

Syntax: OCD

Remarks: Data correction is valid for normalization and electrical length and, if applicable, time domain. Wait for full sweep to be updated (WFS) prior to outputting data.

Data I/O: Outputs a floating point array whose size is equal to twice the number of points in the current sweep (contains real and imaginary data pairs for each point). The OCD command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: FMA, FMB, FMC, LSB, MSB, ORD, OFD, ONP, WFS, CH1-CH4

OCF Output front panel setup and calibration data **DATA TRANSFER (Ch 7)**

Syntax: OCF

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3). This same data can later be input using the ICF command. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 21690 bytes (NO CALIBRATION) 188371 bytes (CALIBRATION APPLIED)

Related Commands: OFP, ICF

OCL Output all applicable calibration coefficients for cal type **DATA TRANSFER (Ch 7)**

Syntax: OCL

Remarks: Outputs all error correction coefficients applicable to the current calibration type; see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to the currently set number of data points. The OCL command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (2 * NUMBER OF POINTS) * (NUMBER OF CAL TERMS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OC1-OC12, OCA, OCB, OCC, ICL, ONCP, ONP

OCM Select offset short calibration method **CALIBRATION (Ch 5)**

Syntax: OCM

Related Commands: LCM, SCM

OCS Output internal buffer collected data **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: OCS

Remarks: The entire contents of the internal buffer are output and the buffer reset. The output format is always FMC.

Data I/O: The data is output as an <Arbitrary Block> (pragraph 11-3).

Block Size: The size of the block depends of the number of data points collected. SIZE = 8 * number of points.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CFD, CRD, DCCTN, DCCTN?, DCHLD, DCMRK

ODAT Output hard copy tabular data to GPIB **HARD COPY (Ch 8)**

Syntax: ODAT

Remarks: Tabular data is the same as the data saved in a tabular data file (*.DAT).

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: Size varies depending on the display type and number of data points. A 4 channel display at 401 data points produces 62,479 bytes. 4 channel 1601 points produces 239,780 bytes. 1 channel 401 points produces 22,530 bytes.

Related Commands: SAVE, DISKRD, OHGL, OS2P, OTXT

ODR Output directory listing of the floppy drive **DATA TRANSFER (Ch 7)**

Syntax: ODR

Data I/O: Outputs <Arbitrary Block> formatted list (paragraph 10-3) of comma separated filenames and sizes.

Block Size: 50 + 80 * (NUMBER OF FILES)

ODRH Output directory listing of the hard drive **DATA TRANSFER (Ch 7)**

Syntax: ODRH

Data I/O: Outputs <Arbitrary Block> formatted list (paragraph 10-3) of comma separated filenames and sizes.

Block Size: 50 + 80 * (NUMBER OF FILES)

ODV Output distance values for time domain **DATA TRANSFER (Ch 7)**

Syntax: ODV

Remarks: The converted distance values depend on the dielectric type set (see DISPLAY group, Dielectric commands).

Data I/O: An array of floating point values whose size is the currently set number of data points. The ODV command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: FMA, FMB, FMC, LSB, MSB, ONP, OTV, OFV

OEB Output extended status byte **STATUS REPORTING (Ch 7)**

Syntax: OEB

Remarks: Returns the decimal value of the binary bit pattern of the Extended Event Status Register. The value will be from 0 to 32767.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3.)

Related Commands: IEM, OEM

OEL Output error list **DATA TRANSFER (Ch 7)**

Syntax: OEL

Data I/O: Outputs formatted list of error messages separated with commas.

Block Size: 50 + 50 * (NUMBER OF ERRORS)

Related Commands: ONE, OGE, OGL

OEM Output extended status byte mask **STATUS REPORTING (Ch 7)**

Syntax: OEM

Remarks: Returns the decimal value of the bit pattern of the Extended Event Status Enable Register. The value will be from 0 to 32767.

Data I/O: Outputs value in ASCII <NR1> format paragraph 10-3)

Related Commands: IEM

OFD Output final data for active channel parameter **DATA TRANSFER (Ch 7)**

Syntax: `OFD`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter).

Data I/O: Outputs a floating point array whose size is equal to the number of points in the current sweep (the array is doubled for dual graph displays, that is,. log mag/phase).

The OFD command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: SINGLE GRAPH DPR0 MODE 12 + (NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE DUAL GRAPH OR SINGLE GRAPH DPR1 MODE 12 + (2 * NUMBER , OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, ONP, OCD, ORD, CH1-CH4, WFS

OFF Enter offset value for top graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF val1 unit(s)`
Val 1: Depends on graph type (see DISPLAY group).
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: SCL, ASC, CH1-CH4

OFF2 Enter offset value for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF2 val1 unit(s)`
Val 1: Depends on graph type (see DISPLAY group).
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: SCL2, REF2

OFF2? Output offset value for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF2?`

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: OFF2

OFF? Output offset value for top graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF?`

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

OFP Output current front panel setup **DATA TRANSFER (Ch 7)**

Syntax: `OFP`

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for input later using the IFP command. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: OCF, IFP

OFV Output frequency values **DATA TRANSFER (Ch 7)**

Syntax: `OFV`

Remarks: An array of floating point values whose size is the currently set number of data points. The OFV command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: ONP, FMA, FMB, FMC, LSB, MSB

OGCFD Output gain compression final data to GPIB **MEASUREMENT DATA (Ch 7)**

Syntax: OGCFD

Remarks: The data consists of two elements per swept power gain compression frequency point. The first element is the input power which produces the target gain compression value, and the second element is the output power corresponding to that input power. The format of the output data depends on the FMA, FMB or FMC mode programmed.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: The block size depends on the number of frequency points and the FMA, FMB or FMC mode. For 10 frequency points, FMA produced 386 bytes, FMB produces 167 bytes and FMC produces 86 bytes. For 5 frequency points, FMA produces 196 bytes, FMB produces 86 bytes and FMC produces 46 bytes.

Related Commands: SPGCA, MFGCT

OGCFV Output gain compression frequency values to GPIB **MEASUREMENT DATA (Ch 7)**

Syntax: OGCFV

Remarks: This mnemonic outputs the frequency values for the swept power gain compression application.

Data I/O: The data is formatted depending on the FMA, FMB, FMC, LSB, MSB formats and encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: The block size depends on the number of data points and the FMA, FMB, FMC format. For ten frequency points, FMA produces 195 bytes, FMB produces 85 bytes, FMC produces 45 bytes. For five frequency points, FMA produces 99 bytes, FMB produces 45 bytes and FMC produces 25 bytes.

Related Commands: SPGCA, IFV, ONDF

OGCTXT Output text format gain compression data to GPIB **HARD COPY (Ch 8)**

Syntax: OGCTXT

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: The block size depends on the number of frequency points. 10 frequency points produces 711 bytes. 5 frequency points produces 430 bytes.

Related Commands: SPGCA, MFGCT, SAVEGC

OGE Output extended description of current GPIB error — **DATA TRANSFER (Ch 7)**

Syntax: `OGE`

Remarks: See error handling information in Chapter 7 for interpretation of the output string.

Data I/O: Outputs string in <Arbitrary ASCII> format.

Block Size: 210 bytes, maximum

Related Commands: ONE, OEL

OGL Output extended description of previous GPIB error — **DATA TRANSFER (Ch 7)**

Syntax: `OGL`

Remarks: See error handling information in Chapter 7 for interpretation of the output string.

Data I/O: Outputs string in <Arbitrary ASCII> format.

Block Size: 210 bytes, maximum

Related Commands: ONE, OEL.

OHDR Output hard copy header information to GPIB — **HARD COPY (Ch 8)**

Syntax: `OHDR`

Data I/O: Outputs data in Arbitrary Block format (paragraph 10-3).

Block Size: A maximum of approximately 1500 bytes

OHDW Output hardware cal data to GPIB — **MISCELLANEOUS (Ch 7)**

Syntax: `OHDW "type"`

Val 1: A three character string that indicates the type of hardware calibration data to output.

Remarks: The three character strings to indicate the currently defined hardware calibration types are: "ALL" for the combined hardware calibration data, "ALC" for the ALC calibration data, "FRE" for the frequency calibration data, "LO1" for the First LO calibration data, "LO2" for the Second LO calibration data and "SLT" for the source lock threshold calibration data.

Data I/O: The data is output in <Arbitrary Block> format (paragraph 10-3).

Block Size: The "ALL" data is 1191 bytes, the "ALC" data is 297 bytes, the "FRE" data is 436 bytes, the "LO1" data is 351 bytes, the "LO2" data is 351 bytes and the "SLT" data is 293 bytes.

Related Commands: IHDW, SAVE, DISKRD

OHGL Output HPGL format data to GPIB **HARD COPY (Ch 8)**

Syntax: `OHGL`

Remarks: This is the same data which gets written to the plotter on a plot.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: The block size varies depending on the display and number of data points. A four-channel display with 401 points produces 40,314 bytes. A four-channel 1601 point display produces 110,314 bytes. A single channel 401 point display produces 12,659 bytes.

Related Commands: SAVE, DISKRD, ODAT, OS2P, OTXT

OHM Suffix sets impedance data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `OHM`

OID Output instrument identification string **DATA TRANSFER (Ch 7)**

Syntax: `OID`

Remarks: Outputs the VNA operation string containing the following fields separated by commas: Model, Low Frequency in GHz, High Frequency in GHz, Low Power in dB, Reset Power in dB, Software Revision. The actual information for the 37XXX queried will be returned in each field. The power values indicate the ALC range. Use the PIP? query to output absolute power setting at

Port 1.

NOTE: System power in excess of reset level is available, but not guaranteed to remain level. Excessive system power setting will cause error 5110: RF PWR UNLEVELED and/or error 52XX: RF OVERLOAD to be reported. To determine maximum available power, consult Source Control Specifications in Operation Manual.

Data I/O: Outputs an <Arbitrary ASCII > format (paragraph 10-3).

Block Size: 50 bytes, maximum

Related Commands: *IDN?, *OPT?, PIP?

OLB Output limits status byte **STATUS REPORTING (Ch 7)**

Syntax: `OLB`

Remarks: Returns the decimal value of the bit pattern of the Limits Status Register. The value will be 0 - 255.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3).

Related Commands: ILB

OLM Output limits status byte mask **DATA TRANSFER (Ch 7)**

Syntax: `OLM`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).

Related Commands: ILM

OM1 Output marker 1 value **DATA TRANSFER (Ch 7)**

Syntax: `OM1`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: CH1-CH4, DPR0, DPR1

OM2 Output marker 2 value **DATA TRANSFER (Ch 7)**

Syntax: OM2

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: CH1-CH4, DPR0, DPR1

OM3 Output marker 3 value **DATA TRANSFER (Ch 7)**

Syntax: OM3

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: CH1-CH4, DPR0, DPR1

OM4 Output marker 4 value **DATA TRANSFER (Ch 7)**

Syntax: OM4

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: CH1-CH4, DPR0, DPR1

OM5 Output marker 5 value **DATA TRANSFER (Ch 7)**

Syntax: OM5

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: CH1-CH4, DPR0, DPR1

OM6 Output marker 6 value **DATA TRANSFER (Ch 7)**

Syntax: OM6

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see paragraph 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Related Commands: CH1-CH4, DPR0, DPR1

ONCP Output number of points for current calibration **DATA TRANSFER (Ch 7)**

Syntax: ONCP

Data I/O: Outputs the number of points in ASCII <NR1> format (paragraph 10-3).

Related Commands: ONP

ONCT Output number of cal terms for current calibration **CALIBRATION (Ch 5)**

Syntax: ONCT

Remarks: Outputs the value in ASCII <NR1> format (paragraph 10-3). See Table 10-1 at the end of this chapter.

ONDF Output number of discrete frequencies **MEASUREMENT (Ch 4)**

Syntax: ONDF

Data I/O: Outputs number in ASCII <NR1> format (paragraph 10-3).

Related Commands: IFV, DFC

ONE Output number of lines in the error list **DATA TRANSFER (Ch 7)**

Syntax: ONE

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).

Related Commands: OEL, OGE, OGL

ONP Output number of points currently being measured **MEASUREMENT DATA (Ch 7)**

Syntax: ONP

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).

ONPV Output the number of power sweep power values **MEASUREMENT DATA (Ch 7)**

Syntax: ONPV

Data I/O: Outputs number in ASCII <NR1> format (paragraph 10-3).

Related Commands: PSTRT, PSTOP, PSTEP, OPSV

ONRM Output stored normalization data to GPIB **MISCELLANEOUS (Ch 7)**

Syntax: ONRM

Remarks: If normalization data has been stored, it will be output

Data I/O: The data will be encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: 12832 bytes

Related Commands: INRM, SAVE, DISKRD

OPB Output the 488.2 Status Byte value (same as *STB?) **IEEE 488.2 (Ch 7)**

Syntax: OPB

Remarks: This is the equivalent command to *STB?, 488.2 Status Byte query. Returns the decimal value of the bit pattern of the Status Byte and the Master Summary Status bit 6. The value will be 0 to 255.

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3)

Related Commands: *STB?

OPSV Output power sweep power values **MEASUREMENT DATA (Ch 7)**

Syntax: OPSV

Remarks: This mnemonic outputs the power values for power sweep.

Data I/O: The data is formatted depending on the FMA, FMB, FMC, LSB, MSB formats and encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: The block size depends on the number of data points and the FMA, FMB, FMC format. For 21 power points, FMA produces 404 bytes, FMB produces 174 bytes, FMC produces 89 bytes. For 11 power points, FMA produces 214 bytes, FMB produces 93 bytes and FMC produces 49 bytes.

Related Commands: PSTRT, PSTOP, PSTEP, ONPV

ORD Output raw data for active channel parameter **DATA TRANSFER (Ch 7)**

Syntax: ORD

Remarks: Outputs the raw data (real and imaginary) pairs before any correction is applied. Wait for full sweep to be updated (WFS) prior to outputting data.

Data I/O: Outputs a floating point array whose size is equal to twice the number of points in the current sweep (contains real and imaginary data pairs for each point). The ORD command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (2 * NUMBER OF POINTS)
*18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: CH1-CH4, OFD, OCD, ONP, FMA, FMB, FMC, LSB, MSB

OS1 Output front panel setup number 1 **DATA TRANSFER (Ch 7)**

Syntax: OS1

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS10 Output front panel setup number 10 **DATA TRANSFER (Ch 7)**

Syntax: `OS10`

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS11C Output corrected S11 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS11C`

Remarks: If S11 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S11 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes, 401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, OCD, OS11R, FMA, FMB, FMC

OS11R Output raw S11 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS11R`

Remarks: If S11 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S11 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additiionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes, 401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, ORD, OS11C, FMA, FMB, FMC

OS12C Output corrected S12 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS12C`

Remarks: If S12 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S12 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes, 401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, OCD, OS12R, FMA, FMB, FMC

OS12R Output raw S12 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS12R`

Remarks: If S12 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S12 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additiionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes, 401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, ORD, OS12C, FMA, FMB, FMC

OS2 Output front panel setup number 2 **DATA TRANSFER (Ch 7)**

Syntax: `OS2`

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS21C Output corrected S21 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS21C`

Remarks: If S21 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S21 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes,

401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, OCD, OS21R, FMA, FMB, FMC

OS21R Output raw S21 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS21R`

Remarks: If S21 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S21 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes, 401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, ORD, OS21C, FMA, FMB, FMC

OS22C Output corrected S22 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS22C`

Remarks: If S22 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S22 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes,

401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, OCD, OS22R, FMA, FMB, FMC

OS22R Output raw S22 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS22R`

Remarks: If S22 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S22 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3). The data itself is a complex pair for each data point which is additiionally formatted by the FMA, FMB and FMC modes.

Block Size: The size depends on the number of data points and the format mode. For FMA output mode, 51 points produces 1,944 bytes, 401 produces 15,237 bytes and 1601 produces 60,845 bytes. For the FMB mode, 51 points produces 822 bytes, 401 points produces 6,423 bytes and 1601 points produces 25,624 bytes. For the FMC mode, 51 points produces 414 bytes, 401 points produces 3,215 bytes and 1601 points produces 12,816 bytes.

Related Commands: CHx, ORD, OS22C, FMA, FMB, FMC

OS2P Output S2P format data to GPIB **HARD COPY (Ch 8)**

Syntax: `OS2P`

Remarks: The S2P output format is provided to interface with application programs requiring that kind of data.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: The block size varies depending on the number of data points. 51 points produces 5,406 bytes, 401 points produces 41,107 bytes, 1601 points produces 163,508 bytes.

Related Commands: SAVE, DISKRD, ODAT, OHGL, OTXT

OS3 Output front panel setup number 3 **DATA TRANSFER (Ch 7)**

Syntax: `OS3`

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS4 Output front panel setup number 4 **DATA TRANSFER (Ch 7)**

Syntax: `OS4`

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS5 Output front panel setup number 5 **DATA TRANSFER (Ch 7)**

Syntax: `OS5`

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS6 Output front panel setup number 6 **DATA TRANSFER (Ch 7)**

Syntax: `OS6`

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS7 Output front panel setup number 7 **DATA TRANSFER (Ch 7)**

Syntax: OS7

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS8 Output front panel setup number 8 **DATA TRANSFER (Ch 7)**

Syntax: OS8

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS9 Output front panel setup number 9 **DATA TRANSFER (Ch 7)**

Syntax: OS9

Data I/O: <Arbitrary Block> formatted data (paragraph 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OSL Output service log **DATA TRANSFER (Ch 7)**

Syntax: OSL

Remarks: This command is useful when troubleshooting system failure or GPIB programming type problems. It is also useful for capturing and archiving error information for errors that occur during Remote Only operation.

Data I/O: Outputs formatted data that consists of service data and all error messages, with details about each error.

Block Size: 450 + 100 * (NUMBER OF ERRORS)

Related Commands: OEL, PSL, SAVLOG, SAVLOGH, CSL, ONE, OGE, OGL

OTV Output time values for time domain **MEASUREMENT DATA (Ch 7)**

Syntax: `OTV`

Data I/O: An array of floating point values whose size is the currently set number of data points. The OTV command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: FMA, FMB, FMC, LSB, MSB, ODV, OFV, ONP

OTXT Output text format data to GPIB **HARD COPY (Ch 8)**

Syntax: `OTXT`

Remarks: Outputs data similar to tabular except data fields are separated with a tab character (ASCII value of 9) for easier loading and display in Microsoft Excel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (paragraph 10-3).

Block Size: The block size varies depending on the display and number of data points. A 4 channel display with 401 points produces 39,465 bytes. A 4 channel 1601 point display produces 154,905bytes. A single channel 401 point display produces 13,625 bytes.

Related Commands: SAVE, DISKRD, ODAT, OHGL, OS2P

P1C Select port 1 for connector specification **CALIBRATION (Ch 5)**

Syntax: `P1C`

Remarks: Specifies port 1 as the port to which subsequent connector related commands will apply.

Related Commands: P2C

P1C? Output port 1 connector type **CALIBRATION (Ch 5)**

Syntax: `P1C?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for SMA male, "2" for SMA female, "3" for K male, "4" for K female, "5" for Type N male, "6" for Type N female, "7" for GPC 3.5 male, "8" for GPC 3.5 female, "9" for GPC 7, "10" for other & user specified, "11" for V male, "12" for V female, "13" for TNC male, "14" for TNC female, "15" for 2.4 mm male, "16" for 2.4 mm female.

P1MMN Set Port 1 Millimeter Wave Head to None **MILLIMETER WAVE (Ch 9)**

Syntax: `P1MMN`

Related Commands: P1MMR, P1MMT,P1MMX?

P1MMR Set Port 1 Millimeter Wave Head to Receiver (3741) **MILLIMETER WAVE (Ch 9)**

Syntax: `P1MMR`

Related Commands: P1MMN, P1MMT,P1MMX?

P1MMT Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740) **MILLIMETER WAVE (Ch 9)**

Syntax: `P1MMT`

Related Commands: P1MMN, P1MMR,P1MMX?

P1MMX? Output Port 1 Millimeter Wave Head type **MILLIMETER WAVE (Ch 9)**

Syntax: `P1MMX?`

Data I/O: Returns a value in ASCII <NR1> format (paragraph 10-3) as follows: (0=none,1=Transmit/Receiver,2=Receiver)

Related Commands: P1MMN,P1MMR, P1MMT

P1P? Output approximate power level at port 1 **CALIBRATION (Ch 5)**

Syntax: `P1P?`

Remarks: Absolute power setting in dB. Includes flat test port power correction, when applied.

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

Related Commands: PWR?, SA1?, FP0, FP1

P2C Select port 2 for connector specification **CALIBRATION (Ch 5)**

Syntax: `P2C`

Related Commands: P1C

P2C? Output port 2 connector type **CALIBRATION (Ch 5)**

Syntax: `P2C?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows:

"1" for SMA male, "2" for SMA female, "3" for K male, "4" for K female, "5" for Type N male, "6" for Type N female, "7" for GPC 3.5 male, "8" for GPC 3.5 female, "9" for GPC 7, "10" for other & user specified, "11" for V male, "12" for V female, "13" for TNC male, "14" for TNC female, "15" for 2.4 mm male, "16" for 2.4 mm female.

P2MMN Set Port 2 Millimeter Wave Head to none **MILLIMETER WAVE (Ch 9)**

Syntax: `P2MMN`

Related Commands: P2MMR, P2MMT,P2MMX?

P2MMR Set Port 2 Millimeter Wave Head to Receiver (3741) **MILLIMETER WAVE (Ch 9)**

Syntax: `P2MMR`

Related Commands: P2MMN,P2MMT,P2MMX?

P2MMT Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740) **MILLIMETER WAVE (Ch 9)**

Syntax: `P2MMT`

Related Commands: P2MMN,P2MMR,P2MMX?

P2MMX? Output Port 2 Millimeter Wave Head type **MILLIMETER WAVE (Ch 9)**

Syntax: `P2MMX?`

Data I/O: Returns a value in ASCII <NR1> format (paragraph 10-3) as follows: (0=none,1=Transmit/Receiver,2=Receiver)

Related Commands: P2MMN,P2MMR, P2MMT

PBL Select 1/4 size plot bottom left corner **HARD COPY (Ch 8)**

Syntax: `PBL`

Remarks: Selects a quarter-size plot, which appears in the bottom left corner of the screen.

Related Commands: PBR, PFL

PBR Select 1/4 size plot bottom right corner **HARD COPY (Ch 8)**

Syntax: `PBR`

Remarks: Selects a quarter-size plot, which appears in the bottom right corner of the screen.

Related Commands: PBL, PFL

PCP Select measurement phase polar chart mode **DISPLAY (Ch 4)**

Syntax: `PCP`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PCS Select sweep position polar chart mode **DISPLAY (Ch 4)**

Syntax: `PCS`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PCX? Output polar chart mode **DISPLAY (Ch 4)**

Syntax: `PCX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for phase or "2" for position.

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PDR Print directory listing of the floppy drive **DISK FUNCTION (Ch 8)**

Syntax: `PDR`

Remarks: A copy of the directory listing of the floppy drive is sent to the printer.

Related Commands: ODR, ODRH, PDRH

PDRH Print directory listing of the hard drive **DISK FUNCTION (Ch 8)**

Syntax: `PDRH`

Remarks: A copy of the directory listing of the hard drive is sent to the printer.

Related Commands: ODR, ODRH, PDR

PEL Print the error list **SERVICE LOG (Ch 8)**

Syntax: `PEL`

Remarks: A formatted list of the error messages in the service log is sent to the printer.

Related Commands: OFL, OSL, PSL

PFL Select full-size plot **HARD COPY (Ch 8)**

Syntax: `PFL`

Related Commands: PBL, PFR

PFS Print full screen image **HARD COPY (Ch 8)**

Syntax: `PFS`

Related Commands: PGR

PGR Print graph area screen image **HARD COPY (Ch 8)**

Syntax: `PGR`

Related Commands: PFS

PGT Plot graticule **DISK FUNCTION (Ch 8)**

Syntax: `PGT`

PHA Select phase display for active channel **DISPLAY (Ch 4)**

Syntax: `PHA`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PHO Enter phase offset for display channel **DISPLAY (Ch 4)**

Syntax: `PHO val1 unit(s)`
Val 1: 080 to +180
Units: DEG

PHO? Output phase offset for display channel **DISPLAY (Ch 4)**

Syntax: `PHO?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

PLD Plot data area only **HARD COPY (Ch 8)**

Syntax: `PLD`

PLG Select log polar display for active channel **DISPLAY (Ch 4)**

Syntax: `PLG`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PLH Plot header **HARD COPY (Ch 8)**

Syntax: `PLH`

PLM Plot markers and limits **HARD COPY (Ch 8)**

Syntax: PLM

PLO? Output plot mode portrait or landscape **HARD COPY (Ch 8)**

Syntax: PLO

Data I/O: Outputs value in ASCII <NR1> format, as follows: "0" for portrait, "1" for landscape.

Related Commands: PORT, LAND

PLR Select linear polar display for active channel **DISPLAY (Ch 4)**

Syntax: PLR

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, REL, RIM, SMC, SME, SMI, SWR

PLS Plot entire screen **HARD COPY (Ch 8)**

Syntax: PLS

Related Commands: CH1-CH4

PLT Plot data traces only **HARD COPY (Ch 8)**

Syntax: PLT

PMK Print tabular data for Markers **HARD COPY (Ch 8)**

Syntax: PMK

Related Commands: CH1-CH4

PMN Plot menu **HARD COPY (Ch 8)**

Syntax: PMN

PMT Print tabular data for traces and markers **HARD COPY (Ch 8)**

Syntax: PMT

Related Commands: CH1-CH4

PORT Select portrait mode for output plot **HARD COPY (Ch 8)**

Syntax: `PORT`

Related Commands: LAND, PLO?

POW Select power out display for active channel **DISPLAY (Ch 4)**

Syntax: `POW`

Related Commands: DLA, IMG, ISC, ISE, ISM, IMG, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, REL, RIM, SMC, SME, SMI, SWR

PRT? Perform printer test and output status **PERIPHERAL TESTS (Ch 8)**

Syntax: `PRT?`

Remarks: For service use only. Requires a special test fixture.

Data I/O: Returns a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for No failure or "1" for Failed.

PS Suffix sets time data type and scales by 1E02 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `PS`

PSC Suffix sets time data type and scales by 1E02 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `PSC`

PSET Enter target power for gain compression receiver cal **GAIN COMPRESSION (Ch 9)**

Syntax: `PSET val1 unit(s)`
Val 1: The value in ASCII <NRF> format (paragraph 10-3)
Units: DB

Related Commands: SPGCA, PSET?, CALR

PSET? Output target power for gain compression receiver cal **GAIN COMPRESSION (Ch 9)**

Syntax: PSET?

Data I/O: The value is output in ASCII <NR3> format (paragraph 10-3)

Related Commands: SPGCA, PSET, CALR

PSL Print the service log **DIAGNOSTICS (Ch 8)**

Syntax: PSL

PSP Enter number of power sweeps for flat power correction (obsolete) **CALIBRATION (Ch 5)**

Syntax: PSP val1 unit(s)
Val 1: 1 - 5
Units: XX1

Remarks: OBSOLETE CODE

Related Commands: PSP?

PSP? Output number of power sweeps for flat power correction (obsolete) **CALIBRATION (Ch 5)**

Syntax: PSP?

Remarks: OBSOLETE CODE

Data I/O: Outputs the value in ASCII <NR1> format.

Related Commands: PSP

PST Stop print/plot **HARD COPY (Ch 8)**

Syntax: PST

PSTEP Enter power sweep step size **GAIN COMPRESSION (Ch 9)**

Syntax: PSTEP val1 unit(s)
Val 1: The power step value in ASCII <NRF> format (paragraph 10-3)
Units: DB

Related Commands: PSTRT, PSTOP

PSTEP? Output power sweep step size **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTEP?`

Data I/O: The value is output in ASCII <NR3> format (paragraph 10-3).

Related Commands: PSTRT, PSTOP, PSTEP

PSTOP Enter power sweep stop power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTOP val1 unit(s)`
Val 1: The stop power in ASCII <NRF> format (paragraph 10-3).
Units: DB

Related Commands: PSTRT, PSTEP

PSTOP? Output power sweep stop power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTOP?`

Data I/O: The value is output in ASCII <NR3> format (paragraph 10-3).

Related Commands: PSTRT, PSTOP, PSTEP

PSTRT Enter power sweep start power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTRT val1 unit(s)`
Val 1: The start power in ASCII <NRF> format (paragraph 10-3)
Units: DB

Related Commands: PSTOP, PSTEP

PSTRT? Output power sweep start power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTRT?`

Data I/O: The value is output in ASCII <NR3> format (paragraph 10-3).

Related Commands: PSTRT, PSTOP, PSTEP

PSWC Perform power sweep linearity calibration **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWC`

Remarks: Command will start the calibration. The frequency list and power sweep power values must have already been entered.

Related Commands: SPGCA, PSTRT, PSTOP, PSTEP, IFV

PSWC0 Turn power sweep linearity calibration off **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWC0`

Remarks: The power sweep linearity calibration coefficients will not be applied to the power.

Related Commands: PSWC1, PSWCX?

PSWC1 Turn power sweep linearity calibration on **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWC1`

Remarks: The power sweep linearity calibration coefficients will be applied to the power output.

Related Commands: PSWC0, PSWCX?

PSWCX? Output power sweep linearity calibration on/off status **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWCX?`

Data I/O: The value will be ouput in ASCII <NR1> format (paragraph 10-3). (0 for calibration off, 1 for calibration on).

Related Commands: PSWC0, PSWC1

PSWP0 Turn power sweep off **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWP0`

Remarks: Turns power sweep off at the current CWF frequency.

Related Commands: CWF, PSWP1, PSWPX?

PSWP1 Turn power sweep on **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWP1`

Remarks: Turns power sweep on at the current CWF frequency.

Related Commands: CWF, PSWP0, PSWPX?

PSWPX? Output power sweep on/off status **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWPX?`

Data I/O: The value will be output in ASCII <NR1> format (paragraph 10-3) as follows: "0" for power sweep is off or "1" for power sweep is on.

Related Commands: PSWP0, PSWP1

PT0 Set tabular printout points skipped to 0 **HARD COPY (Ch 8)**

Syntax: `PT0`

PT1 Set tabular printout points skipped to 1 **HARD COPY (Ch 8)**

Syntax: `PT1`

PT2 Set tabular printout points skipped to 2 **HARD COPY (Ch 8)**

Syntax: `PT2`

PT3 Set tabular printout points skipped to 3 **HARD COPY (Ch 8)**

Syntax: `PT3`

PT4 Set tabular printout points skipped to 4 **HARD COPY (Ch 8)**

Syntax: `PT4`

PT5 Set tabular printout points skipped to 5 **HARD COPY (Ch 8)**

Syntax: `PT5`

PT6 Set tabular printout points skipped to 6 **HARD COPY (Ch 8)**

Syntax: `PT6`

PT7 Set tabular printout points skipped to 7 **HARD COPY (Ch 8)**

Syntax: `PT7`

PT8 Set tabular printout points skipped to 8 **HARD COPY (Ch 8)**

Syntax: `PT8`

PT9 Set tabular printout points skipped to 9 **HARD COPY (Ch 8)**

Syntax: `PT9`

PTB Print tabular data for Traces **HARD COPY (Ch 8)**

Syntax: `PTB`

Related Commands: PT0-PT9

PTL Select 1/4 size plot top left corner **HARD COPY (Ch 8)**

Syntax: `PTL`

Related Commands: PTR, PBR, PBL, PFL

PTP Enter the target power for flat power correction **MEASUREMENT (Ch 4)**

Syntax: `PTP val1 unit(s)`
Val 1: The power level in ASCII <NRF> format (paragraph 10-3)
Units: DBM

Remarks: The calibration will be performed using this as the power level to be achieved.

Related Commands: PTP?, SFC, FP0, FP1

PTP? Output the target power for flat power correction **MEASUREMENT (Ch 4)**

Syntax: `PTP?`

Data I/O: The target value will be output in ASCII <NR3> format (paragraph 10-3).

Related Commands: PTP, SFC, FP0, FP1

PTR Select 1/4 size plot top right corner **HARD COPY (Ch 8)**

Syntax: `PTR`

Related Commands: PTL, PBR, PBL, PFL

PTS Enter number of points to be skipped during flat power correction **CALIBRATION (Ch 5)**

Syntax: `PTS val1 unit(s)`
Val 1: 1 to 65
Units: XX1

PTS? Output number of points to be skipped during flat power correction **CALIBRATION (Ch 5)**

Syntax: `PTS?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).

PW2 Enter external source power level **MEASUREMENT (Ch 4)**

Syntax: `PW2 val1 unit(s)`
Val 1: Depends on power range of source
Units: DBM, XX1, XX3, XM3

PW2? Output external source power level **MEASUREMENT (Ch 4)**

Syntax: `PW2?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

PWR Enter internal source power level **MEASUREMENT (Ch 4)**

Syntax: `PWR val1, unit(s)`
Val 1: Depends on 37XXX power range
Units: DB, XX1, XX3, XM3

Related Commands: OID, P1P?, PWR?

PWR? Output internal source power level **MEASUREMENT (Ch 4)**

Syntax: PWR?

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

Related Commands: OID, PIP?

Q22 Set Millimeter Wave Band to Q Band (WR-22) — MILLIMETER WAVE (Ch 9)

Syntax: Q22

RAD Suffix sets phase data type and scales by 180/pi — DATA ENTRY SUFFIXES (Ch 4)

Syntax: RAD

RC1 Recall front panel setup number 1 from memory — SAVE/RECALL (Ch 8)

Syntax: RC1

RC10 Recall front panel setup number 10 from memory — SAVE/RECALL (Ch 8)

Syntax: RC10

RC2 Recall front panel setup number 2 from memory — SAVE/RECALL (Ch 8)

Syntax: RC2

RC3 Recall front panel setup number 3 from memory — SAVE/RECALL (Ch 8)

Syntax: RC3

RC4 Recall front panel setup number 4 from memory — SAVE/RECALL (Ch 8)

Syntax: RC4

RC5 Recall front panel setup number 5 from memory — SAVE/RECALL (Ch 8)

Syntax: RC5

RC6 Recall front panel setup number 6 from memory — SAVE/RECALL (Ch 8)

Syntax: `RC6`

RC7 Recall front panel setup number 7 from memory — SAVE/RECALL (Ch 8)

Syntax: `RC7`

RC8 Recall front panel setup number 8 from memory — SAVE/RECALL (Ch 8)

Syntax: `RC8`

RC9 Recall front panel setup number 9 from memory — SAVE/RECALL (Ch 8)

Syntax: `RC9`

RD Remove a disk directory — DISK FUNCTION (Ch 8)

Syntax: `RD "pathspec"`
Val 1: "pathspec" is a combination of letters, numbers, \ characters and underscores which spell out the path and directory name

Remarks: "pathspec" may include a drive letter of the form A: for the floppy disk and C: for the hard drive. Directory names follow the same rules as filenames.

Related Commands: MD

RDA Select automatic reference delay calculation — DISPLAY (Ch 4)

Syntax: `RDA`

Remarks: Calculation impacted by dielectric setting.

Related Commands: CH1-CH4, RDD, RDT, DIx commands in DISPLAY Group.

RDD Enter reference delay in distance for active channel — DISPLAY (Ch 4)

Syntax: `RDD val1 unit(s)`
Val 1: -999.999 to +999.999
Units: M, MTR, MM, MMT, CM, CMT

Remarks: Calculation impacted by dielectric setting.

Related Commands: CH1-CH4, RDA, RDT, DIx commands in DISPLAY Group.

RDD? Output reference delay in distance for active channel — **DISPLAY (Ch 4)**

Syntax: `RDD?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

RDT Enter reference delay in time for active channel — **DISPLAY (Ch 4)**

Syntax: `RDT val1 unit(s)`
Val 1: -999.999 to +999.999
Units: SEC, MS, US, NS, PS

Status Reporting: CH1-CH4, RDD, RDA

RDT? Output reference delay in time for active channel — **DISPLAY (Ch 4)**

Syntax: `RDT?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

RECALL Recall a data file from disk to a task — **DISK FUNCTION (Ch 8)**

Syntax: `RECALL "filename"`
Val 1: filename is the name of the file to be recalled. May include a drive letter and path.

Remarks: Not all files are recallable. One can recall files with the following name/extentions: (front panel and calibration data files) *.CAL, (normalization data files) *.NRM, (tabular data files) *.DAT, (service log files) *.LOG, (error list files) *.ELG, (hardware calibration files) HW_CAL.*, (calibration kit data files) KIT_INFO.*. Recalled tabular data, service log and error list files go to the printer for printing. The others are stored internally.

Related Commands: SAVE

REF Enter reference line for top graph of active channel — **DISPLAY (Ch 4)**

Syntax: `REF val1 unit(s)`
Val 1: 0-8
Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Status Reporting: CH1-CH4, OFF, SCL

REF2 Enter reference line for bottom graph of active channel — **DISPLAY (Ch 4)**

Syntax: `REF2 val1 unit(s)`
Val 1: 0-8
Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Related Commands: CH1-CH4, OFF2, SCL2

REF2? Output reference line for bottom graph of active channel — **DISPLAY (Ch 4)**

Syntax: `REF2?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).

Related Commands: REF2

REF? Output reference line for top graph of active channel — **DISPLAY (Ch 4)**

Syntax: `REF?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).

REL Select real display for active channel — **DISPLAY (Ch 4)**

Syntax: `REL`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, RIM, SMC, SME, SMI, SWR

REU Suffix sets real data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `REU`

RGZ Select reflective device greater than Z0 — **CALIBRATION (Ch 5)**

Syntax: `RGZ`

Related Commands: RLZ

RH0 Select RF off in hold mode — MEASUREMENT (Ch 4)

Syntax: `RH0`

Related Commands: HLD, RHI, BH0

RH1 Select RF on in hold — MEASUREMENT (Ch 4)

Syntax: `RH1`

Related Commands: HLD, RH0, BH0

RHX? Output RF on/off during hold status — MEASUREMENT (Ch 4)

Syntax: `RHX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

RIM Select real and imaginary display for active channel — DISPLAY (Ch 4)

Syntax: `RIM`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMC, SME, SMI, SWR

RLZ Select reflective device less than Z0 — CALIBRATION (Ch 5)

Syntax: `RLZ`

Related Commands: RGZ

RM1 Select reference plane at line 1 midpoint — CALIBRATION (Ch 5)

Syntax: `RM1`

Related Commands: RRP

ROL Enter reflective device offset length — CALIBRATION (Ch 5)

Syntax: `ROL val1 unit(s)`
Val 1: 00.000 to +10.000
Units: MMT, CMT, MTR, MM, CM, M

RPC Repeat previous calibration **CALIBRATION (Ch 5)**

Syntax: `RPC`

Remarks: Performs exactly the same as the BEG command EXCEPT it uses existing calibration setup. This command is useful after re-calling a saved calibration.

Related Commands: BEG, KEC, TC1, TC2, NCS

RPO Enter rear panel dc voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `RPO val1 unit(s)`
Val 1: 00.000 to +10.000
Units: VLT

RPO? Output rear panel dc voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `RPO?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

RRP Select reference plane at reflection plane **CALIBRATION (Ch 5)**

Syntax: `RRP`

Remarks: Selects reference plane to be at the reflection plane for the LRL calibration.

RST Instrument reset (same as *RST) **SYSTEM STATE (Ch 8)**

Syntax: `RST`

Remarks: Resets the 37XXX to default state with all user programmable parameters set to their default values. Default state settings are listed in Chapter 12. This command does not affect the Output Queue, Status or Parallel Poll Registers, or the VNA GPIB address setting.

Related Commands: *RST, RST0, RST1

RST0 Reset instrument front panel memories and reserved parameters — **SYSTEM STATE (Ch 8)**

Syntax: `RST0`

Remarks: Resets the VNA set to their default values. Default state settings are listed in Chapter 12. Additionally, front panel stored setups are cleared, the reserved parameters are set to their default values, and the GPIB address is changed to its default value (6). This command does not effect the Output Queue, Status, or Parallel Poll Registers. Reserved parameters are those parameters which are initialized at factory turn-on. They are also initialized after a battery-backed RAM failure occurs.

Related Commands: *RST, RST, RST1

RST1 Reset instrument and front panel memories — **SYSTEM STATE (Ch 8)**

Syntax: `RST1`

Remarks: Resets the VNA to the default state with all user programmable parameters set to their default values. Default state settings are listed in Chapter 12. Additionally, front panel stored setups are cleared. This command does not effect the Output Queue, Status, Parallel Poll Registers, or the GPIB address.

Related Commands: *RST, RST, RST0

RSTCOL Reset color configuration to default — **SYSTEM STATE (Ch 8)**

Syntax: `RSTCOL`

RSTGC Reset gain compression parameters to default — **GAIN COMPRESSION (Ch 9)**

Syntax: `RSTGC`

Remarks: This is not an instrument reset

RTL Return to local — **SYSTEM STATE (Ch 8)**

Syntax: `RTL`

Remarks: This command performs the same function as the RETURN TO LOCAL key. It has no effect if the VNA is in the local lockout mode.

RV0 Turn rear panel output voltage off — REAR PANEL OUTPUT (Ch 9)

Syntax: `RV0`

RV1 Turn rear panel output voltage on — REAR PANEL OUTPUT (Ch 9)

Syntax: `RV1`

RV1? Output rear panel output voltage on/off status — REAR PANEL OUTPUT (Ch 9)

Syntax: `RV1?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

RVD Set rear panel output mode to dc value — REAR PANEL OUTPUT (Ch 9)

Syntax: `RVD`

Related Commands: RVH, RVV, RVL, RVX?

RVH Set rear panel output mode to horizontal — REAR PANEL OUTPUT (Ch 9)

Syntax: `RVH`

Related Commands: RVD, RVV, RVL, RVX?

RVL Set rear panel output mode to lock direction — REAR PANEL OUTPUT (Ch 9)

Syntax: `RVL`

Related Commands: RVH, RVV, RVD, RVX?

RVV Set rear panel output mode to vertical — REAR PANEL OUTPUT (Ch 9)

Syntax: `RVV`

Related Commands: RVH, RVD, RVL, RVX?

RVX? Output rear panel output mode — REAR PANEL OUTPUT (Ch 9)

Syntax: `RVX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for horizontal, "2" for vertical, "3" for lock dir, "4" for dc output.

S Suffix sets time data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `S`

S11 Measure S11 on active channel **MEASUREMENT (Ch 4)**

Syntax: `S11`

Remarks: Measures the forward reflection parameter, S11, on the active channel. Forward reflection is the value of the signal leaving port 1 vs the value of the signal being reflected back into port 1. Any channel that is displaying the user parameter USR2 will now display S11.

Related Commands: S12, S21, S22, CH1-CH4

S12 Measure S12 on active channel **MEASUREMENT (Ch 4)**

Syntax: `S12`

Remarks: Measures the reverse transmission parameter, S12, on the active channel. Reverse transmission is the value of the signal leaving port 2 vs the value of the signal being received at port 1. Any channel that is displaying the user parameter USR3 will now display S12.

Related Commands: S11, S21, S22, CH1-CH4

S21 Measure S21 on active channel **MEASUREMENT (Ch 4)**

Syntax: `S21`

Remarks: Measures the forward transmission parameter, S21, on the active channel. Forward transmission is the value of the signal leaving port 1 vs the value of the signal being received at port 2. Any channel that is displaying the user parameter USR1 will now display S21.

Related Commands: S11, S12, S22, CH1-CH4

S22 Measure S22 on active channel **MEASUREMENT (Ch 4)**

Syntax: `S22`

Remarks: Measures the reverse reflection parameter, S22, on the active channel. Reverse reflection is the value of the signal leaving port 2 vs the value of the signal being reflected back into port 2. Any channel that is displaying the user parameter USR4 will now display S22.

Related Commands: S11, S12, S21, CH1-CH4

SA1 Enter port 1 source attenuator value **MEASUREMENT (Ch 4)**

Syntax: `SA1 val1 unit(s)`
Val 1: 0 to 70 dB, in 10 dB steps
Units: DB, DBL, DBM, XX1, XX3, XM3

Remarks: Attenuates the signal output from Port 1.

Related Commands: PWR, P1P?, TA2

SA1? Output port 1 source attenuator value **MEASUREMENT (Ch 4)**

Syntax: `SA1?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3).

SAMP2 Use 2 samplers for measurements **MEASUREMENT (Ch 4)**

Syntax: `SAMP2`

Remarks: This configuration provides greater dynamic range but only allows 1 parameter measurements

Related Commands: SAMP?,SAMP3

SAMP3 Use 3 samplers for measurements **MEASUREMENT (Ch 4)**

Syntax: `SAMP3`

Remarks: This configuration is the normal sampler configuration. Since 3 samplers are used, can measure 2 parameters simultaneously however the dynamic range may be degraded do to interaction between samplers.

Related Commands: SAMP?,SAMP2

SAMP? Output the number of samplers used for measurements **MEASUREMENT (Ch 4)**

Syntax: `SAMP?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3). 2 - means low noise 2 sampler measurement, 3 - means normal 3 sampler measurement

Related Commands: SAMP2,SAMP3

SAVE Save a data file to disk **DISK FUNCTION (Ch 8)**

Syntax: `SAVE "filename"`
Val 1: filename is the name of the file to which the data is stored. May include a drive letter, and path. The file name defines the type of data which is to be saved.

Remarks: The following are the types of data and associated file names which can be saved: front panel and calibration data (*.CAL), normalization data (*.NRM), tabular data (*.DAT). S2P format data (*.S2P), text format data (*.TXT), hpgl plot data (*.HGL), black and white windows bit map of screen (*.BMB), color windows bit map of screen (*.BMC), service log data (*.LOG), error list data (*.ELG), hardware calibration files (HW_CAL.*)

Related Commands: RECALL

SAVEGC Save text format gain compression data to disk **DISK FUNCTION (Ch 8)**

Syntax: `SAVEGC "filename"`
Val 1: filename is the name of the file to which the data is stored. May include a drive letter, and path. The extention must be .TXT

Remarks: The data items are separated with tabs (ASCII value 9) in order to be compatible with Microsoft Excel.

Related Commands: SAVE, SPGCA, MFGCT, OGCTXT

SBD Enter substrate dielectric for microstrip calibration **CALIBRATION (Ch 5)**

Syntax: `SBD val1 unit(s)`
Val 1: 1.0 to 9999.99
Units: XX1, XX3, XM3

Status Reporting: SBT

SBT Enter substrate thickness for microstrip calibration — **CALIBRATION (Ch 5)**

Syntax: `SBT val1 unit(s)`
Val 1: 0.001 mm to 1.0 m
Units: M, MTR, MM, MMT, CM, CMT

Status Reporting: SBD

SCL Enter Scale Resolution for top graph of active channel — **DISPLAY (Ch 4)**

Syntax: `SCL val1 unit(s)`
Val 1: Depends on graph type: Mag Resolution: 0.001-50, Phase Resolution: 0.01-90, Polar Resolution: E-9-999.99, Mag Resolution: 200 max, Smith/Inverted Smith: -30, 10, 20, 30
Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Related Commands: OFF, REF, ISE, ISC, SME, SMC

SCL2 Enter Scale Resolution for bottom graph of active channel — **DISPLAY (Ch 4)**

Syntax: `SCL2 val1 unit(s)`
Val 1: Depends on graph type: Mag Resolution: 0.001-50, Phase Resolution: 0.01-90, Polar Resolution: E-9-999.99, Mag Resolution: 200 max, Smith/Inverted Smith: -30, 10, 20, 30
Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Related Commands: OFF2, REF2

SCL2? Output Scale Resolution for bottom graph of active channel — **DISPLAY (Ch**

Syntax: `SCL2?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

Related Commands: SCL2

SCL? Output Scale Resolution for top graph of active channel — **DISPLAY (Ch 4)**

Syntax: `SCL?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

SCM Select standard calibration method — **CALIBRATION (Ch 5)**

Syntax: SCM

Related Commands: LCM, OCM

SDG Start diagnostics mode — **DIAGNOSTICS (Ch 8)**

Syntax: SDG

Remarks: For service use only.

SDR Select standard receiver mode — **DIAGNOSTICS (Ch 8)**

Syntax: SDR

Remarks: For service use only.

SDR? Output receiver mode — **RECEIVER MODE (Ch 9)**

Syntax: SDR?

Data I/O: The receiver mode is output in ASCII <NR1> formate (paragraph 10-3 as follows:,"0" for standard, "1" for source lock with GPIB control off, "2" for source lock with GPIB control on, "3" for tracking with GPIB control off, "4" for tracking with GPIB control on, "5" for set on mode with GPIB off.

Related Commands: SDR, SL1, ST1, TK1

SELINT Select Internal (normal) test set operation — **MILLIMETER WAVE (Ch 9)**

Syntax: SELINT

Related Commands: SELMM,SELXX?

SELMM Select Millimeter Wave test set operation — **MILLIMETER WAVE (Ch 9)**

Syntax: SELMM

Related Commands: SELINT,SELXX?

SELSP Select S-Parameter test set operation — **MEASUREMENT (Ch 4)**

Syntax: SELSP

Related Commands: SELXX?,SELINT,SELMM

SELXX? Output the test set selection MMWave/Internal — MILLIMETER WAVE (Ch 9)

Syntax: SELXX?

Data I/O: Returns a value in ASCII <NR1> format (paragraph 10-3) as follows: (0=internal,1=millimeterwave)

Related Commands: SELINT,SELMM

SETUP Display setup menu — DISPLAY (Ch 4)

Syntax: SETUP

SFC Perform flat test port calibration — CALIBRATION (Ch 5)

Syntax: SFC

SFGCA Select swept frequency gain compression application — GAIN COMPRESSION (Ch 9)

Syntax: SFGCA

Related Commands: SPGCA, UNDOGC

SFGCT Start swept frequency gain compression test — GAIN COMPRESSION (Ch 9)

Syntax: SFGCT

Remarks: Begin testing gain compression over the current frequency range and at the current power level setting.

Related Commands: SFGCA

SH1 Set offset short 1 or 2 offset length for offset short calibration — CALIBRATION (Ch 5)

Syntax: SHx val1 unit(s) x 1, 2
Val 1: -999.999 to +999.999
Units: M, MTR, MM, MMT, CM, CMT

Status Reporting: OCM, WSH1, WSH2

SH2 Set offset short 1 or 2 offset length for offset short calibration — **CALIBRATION (Ch 5)**

Syntax: `SHx val1 unit(s) x 1, 2`
Val 1: -999.999 to +999.999
Units: M, MTR, MM, MMT, CM, CMT

Status Reporting: OCM, WSH1, WSH2

SL1 Select source lock mode — **RECEIVER MODE (Ch 9)**

Syntax: `SL1`

Remarks: For service use only.

SLC Clear all segmented limits definitions — **LIMITS (Ch 6)**

Syntax: `SLC`

SLD Select sliding load for calibration — **CALIBRATION (Ch 5)**

Syntax: `SLD`

Remarks: During calibration the data-taking process for the load includes six slide positions. If any calibration frequencies are below 2 GHz, you must also use a broadband load.

Related Commands: BBL

SLH Enter segmented limits horizontal offset — **LIMITS (Ch 6)**

Syntax: `SLH val1 unit(s)`
Val 1: Frequency, time, or distance in current sweep range
Units: XM3, XX1, XX3

Related Commands: SLV

SLH? Output segmented limits horizontal offset — **LIMITS (Ch 6)**

Syntax: `SLH?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

SLL0 Turn lower segmented limits display off — LIMITS (Ch 6)

Syntax: SLL0

Related Commands: LON, LOF, SLL1

SLL1 Turn lower segmented limits display on — LIMITS (Ch 6)

Syntax: SLL1

Related Commands: LON, LOF, SLL0

SLLX? Output lower segmented limits display on/off status — LIMITS (Ch 6)

Syntax: SLLX?

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

SLT Perform SLT internal calibration — CALIBRATION (Ch 5)

Syntax: SLT

Related Commands: ALC,SFC,L1C,L2C

SLU0 Turn upper segmented limits display off — LIMITS (Ch 6)

Syntax: SLU0

Related Commands: LON, LOF, SLU1

SLU1 Turn upper segmented limits display on — LIMITS (Ch 6)

Syntax: SLU1

Related Commands: LON, LOF, SLL, SLU0

SLUX? Output upper segmented limits display on/off status — LMITS (Ch 7)

Syntax: SLUX?

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

SLV Enter segmented limits vertical offset **LIMITS (Ch 6)**

Syntax: `SLV val1 unit(s)`
Val 1: Depends on graph type(see DISPLAY group)
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: SLH

SLV? Output segmented limits vertical offset **LIMITS (Ch 6)**

Syntax: `SLV?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

SMC Enter scale and select compressed Smith Chart display **DISPLAY (Ch 4)**

Syntax: `SMC 3 DBL`

Remarks: Selects the compressed Smith Chart for display on the active channel.

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMI, SME, SMI, SWR

SME Enter scale and select expanded Smith Chart display **DISPLAY (Ch 4)**

Syntax: `SME val1 unit(s)`
Val 1: 10, 20, 30
Units: DBL, XX1

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMC, SME, SMI, SWR

SMI Select normal Smith Chart for active channel **DISPLAY (Ch 4)**

Syntax: `SMI`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, RIM, SMC, SME, SWR

SMKR Select marker search marker mode **MARKERS (Ch 6)**

Syntax: `SMKR`

Related Commands: AMKR, FMKR, NMKR, XMKR?

SOF Turn off smoothing **ENHANCEMENT (Ch 4)**

Syntax: `SOF`

Related Commands: SON

SOF? Output smoothing on/off status **ENHANCEMENT (Ch 4)**

Syntax: `SOF?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

SON Enter smoothing value and turn on **ENHANCEMENT (Ch 4)**

Syntax: `SON val1 unit(s)`
Val 1: 0 - 20
Units: XX1, XX3, XM3

Related Commands: SOF

SON? Output smoothing value **ENHANCEMENT (Ch 4)**

Syntax: `SON?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

SPAN Enter frequency span **MEASUREMENT (Ch 4)**

Syntax: `SPAN val1 unit(s)`
Val 1: Can be any frequency span up to the high frequency limit minus the low frequency limit of the 37XXX
Units: HZ, KHZ, MHZ, GHZ

Related Commands: CNTR, CNTR?, SPAN?, SRT, SRT?, STP, STP?

SPAN? Output frequency span **MEASUREMENT (Ch 4)**

Syntax: SPAN?

Data I/O: Outputs a value in ASCII <NR3> format (paragraph 10-3).

Related Commands: CNTR, CNTR?, SPAN, SRT, SRT?, STP, STP?

SPD Enter pen speed percentage **HARD COPY (Ch 8)**

Syntax: SPD val1 unit(s)
Val 1: 10 - 100
Units: XX1, XX3, XM3

SPGCA Select swept power gain compression application **GAIN COMPRESSION (Ch 9)**

Syntax: SPGCA

Related Commands: SFGCA, UNDOGC

SPGCT Start swept power gain compression test **GAIN COMPRESSION (Ch 9)**

Syntax: SPGCT

Remarks: Begins the automated sequence which finds the gain compression target at one of the specified frequency points.

Related Commands: SPGCA, MFGCT

SPH Enter active segmented limit horizontal stop position **LIMITS (Ch 6)**

Syntax: SPH val1 unit(s)
Val 1: Frequency, time, or distance in current sweep range
Units: XX1, XX3, XM3

Related Commands: LS01-LS010, US01-US10

SPH? Output active segmented limit horizontal stop position **LIMITS (Ch 6)**

Syntax: SPH?

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

SPV Enter active segmented limit vertical stop position — **LIMITS (Ch 6)**

Syntax: `SPV vall unit(s)`
Val 1: Depends on graph type(see DISPLAY group)
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: LS01-LS010, US01-US10

SPV? Output active segmented limit vertical stop position — **LIMITS (Ch 6)**

Syntax: `SPV?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

SRC1 Select source linearity voltage testing — **DIAGNOSTICS (Ch 8)**

Syntax: `SRC 1`

Remarks: For service use only.

SRC1? Output external source 1 existence information — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10.3), 0 - means external source 1 does not exist, 1 - means external source 1 does exists

Related Commands: SRC2?

SRC1AC Select source 1 as active — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1AC`

Related Commands: SRC1NA, SRC1AC?

SRC1AC? Output source 1 active/inactive status — **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1AC?`

Data I/O: Outputs the status in ASCII <NR1> format (paragraph 10-3) as follows: "0" for inactive or "1" for active.

Related Commands: SRC1AC, SRC1NA

SRC1ADD Enter external source 1 GPIB address **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1ADD val1`
Val 1: 1-30
Units: XX1

Data I/O: Data is input in ASCII <NRf> format (paragraph 10-3)

Related Commands: SRC1ADD?,ADDFC,ADDPM,ADDPLT,SRC2ADD

SRC1ADD? Output external source 1 GPIB address **ADDRESSING (Ch 8)**

Syntax: `SRC1ADD?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3),

Related Commands: SRC1ADD,ADDFC?,ADDPM?,ADDPLT?,SRC2ADD?

SRC1EX Select source 1 as external **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1EX`

Related Commands: SRC1NT,SRC1EX?

SRC1EX? Output source 1 external/internal status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1EX?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3), 0 - means the source is internal, 1 - means the source is external

Related Commands: SRC1EX,SRC1NT

SRC1G0 Turn source 1 GPIB control off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1G0`

Related Commands: SRC1G1,SRC1GX?

SRC1G1 Turn source 1 GPIB control on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1G1`

Related Commands: SRC1G0,SRC1GX?

SRC1GX? Output source 1 GPIB control on/off status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1GX?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3), "0" for OFF or "1" for ON.

Related Commands: SRC1G0,SRC1G1

SRC1MOD? Output external source 1 model/version string **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1MOD?`

Data I/O: Outputs string in <Arbitrary ASCII> format (paragraph 10-3),

Related Commands: SRC2MOD?

SRC1NA Select source 1 as not active **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1NA`

Related Commands: SRC1AC, SRC1AC?

SRC1NT Select source 1 as internal **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1NT`

Related Commands: SRC1EX,SRC1EX?

SRC2 Select source power voltage testing **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC 2`

Remarks: For service use only.

SRC2? Output external source 2 existence information **MEASUREMENT (Ch 4)**

Syntax: `SRC2?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3), 0 - means external source 2 does not exist, 1 - means external source 2 does exist.

Related Commands: SRC1?

SRC2AC Select source 2 as active **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2AC`

Related Commands: SRC2NA, SRC2AC?

SRC2AC? Output source 2 active/inactive status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2AC?`

Data I/O: Outputs the status in ASCII <NR1> format (paragraph 10-3) as follows: "0" for inactive or "1" for active.

Related Commands: SRC2AC, SRC2NA

SRC2ADD Enter external source 2 GPIB address **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2ADD val1`
Val 1: 1-30
Units: XX1

Data I/O: The value is input in ASCII (NRf> format (paragraph 10-3)

Related Commands: SRC2ADD?,ADDFC,ADDPLT,ADDPM,SRC1ADD

SRC2ADD? Output external source 2 GPIB address **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2ADD?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3),

Related Commands: SRC2ADD,ADDFC?,ADDPLT?,ADDPM?,SRC1ADD?

SRC2G0 Turn source 2 GPIB control off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2G0`

Related Commands: SRC2G1, SRC2GX?

SRC2G1 Turn source 2 GPIB control on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC2G1

Related Commands: SRC2G0, SRC2GX?

SRC2GX? Output source 2 GPIB control on/off status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC2GX?

Data I/O: Outputs the status in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: SRC2G0, SRC2G1

SRC2MOD? Output external Source 2 model/version string **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC2MOD?

Data I/O: Outputs string in <Arbitrary ASCII> format (paragraph 10-3)

Related Commands: SRC1MOD?

SRC2NA Select source 2 as not active **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC2NA

Related Commands: SRC2AC, SRC2AC?

SRCH Enter marker search value **MARKERS (Ch 6)**

Syntax: SRCH val1 unit(s)
Val 1: Depends on graph type
Units: Depend on graph type

Related Commands: MKSL, MKSR, SMKR, SRCH?

SRCH? Output marker search value **MARKERS (Ch 6)**

Syntax: SRCH?

Data I/O: Outputs the search value in ASCII <NR3> format (paragraph 10-3).

Related Commands: MKSL, MKSR, SMKR, SRCH

SRT Enter start frequency **MEASUREMENT (Ch 4)**

Syntax: `SRT val1 unit(s)`
Val 1: Can be any frequency from low frequency limit of 37XXX to current sweep stop frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: If a calibration is in place, the lower limit is the calibration start frequency.

Related Commands: STP, CWF

SRT? Output start frequency **MEASUREMENT (Ch 4)**

Syntax: `SRT?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

Related Commands: STP, CWF

ST1 Select set on mode **RECEIVER MODE (Ch 9)**

Syntax: `ST1`

Remarks: For service use only.

STD Store trace to memory on active channel **DISPLAY (Ch 4)**

Syntax: `STD`

Remarks: Stores the active channel's trace data in memory.

Related Commands: MEM, DNM, DTM, CH1-CH4

STH Enter active segmented limit horizontal start position **LIMITS (Ch 6)**

Syntax: `STH val1 unit(s)`
Val 1: Frequency, time, or distance
Units: XX1, XX3, XM3

Related Commands: STV, LS01-LS010, US01-US10

STH? Output active segmented limit horizontal start position **LIMITS (Ch 6)**

Syntax: `STH?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

STP Enter stop frequency **MEASUREMENT (Ch 4)**

Syntax: `STP val1 unit(s)`
Val 1: Can be any frequency from current start-sweep frequency to maximum 37XXX frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Upper frequency limit is reduced to the maximum calibrated frequency if a calibration is in place.

Related Commands: SRT, CWF

STP? Output stop frequency **MEASUREMENT (Ch 4)**

Syntax: `STP?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

STV Enter active segmented limit vertical start position **LIMITS (Ch 6)**

Syntax: `STV val1 unit(s)`
Val 1: Depends on graph type (see DISPLAY group)
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: STH, LS01-LS010, US01-US10

STV? Output active segmented limit vertical start position **LIMITS (Ch 6)**

Syntax: `STV?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

SV1 Save front panel setup number 1 to memory **SAVE/RECALL (Ch 8)**

Syntax: `SV1`

Related Commands: RC1-RC10

SV10 Save front panel setup number 10 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV10

Related Commands: RC1-RC10

SV2 Save front panel setup number 2 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV2

Related Commands: RC1-RC10

SV3 Save front panel setup number 3 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV3

Related Commands: RC1-RC10

SV4 Save front panel setup number 4 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV4

Related Commands: RC1-RC10

SV5 Save front panel setup number 5 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV5

Related Commands: RC1-RC10

SV6 Save front panel setup number 6 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV6

Related Commands: RC1-RC10

SV7 Save front panel setup number 7 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV7

Related Commands: RC1-RC10

SV8 Save front panel setup number 8 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV8

Related Commands: RC1-RC10

SV9 Save front panel setup number 9 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV9

Related Commands: RC1-RC10

SVB Save current band definitions **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SVB

Remarks: See command's functional group

Related Commands: BD-BD5, CLB

SVBMM Save and activate the new Millimeter Wave band definitions **MILLIMETER WAVE (Ch 9)**

Syntax: SVBMM

Remarks: Note that this does not require MSD to actuate the equations

Related Commands: BSP, BST, ED1, ED2, EDR, EDV, EML, EOS, BDMM, CLBMM

SWP Return to normal sweep mode **MEASUREMENT (Ch 4)**

Syntax: SWP

Remarks: Use this command to return to sweep mode from CW.

Related Commands: CWF

SWP? Output sweep mode **MEASUREMENT (Ch 4)**

Syntax: SWP?

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for CW, "2" for discrete fill, "3" for normal sweep, "4" for harmonic time domain.

SWPDIR? Output instantaneous sweep direction forward/reverse — **MEASUREMENT (Ch 4)**

Syntax: `SWPDIR?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for forward or "2" for reverse.

Related Commands: HLD, CTN

SWR Select SWR display for active channel — **DISPLAY (Ch 4)**

Syntax: `SWR`

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMC, SME, SMI

SXX? Output s parameter or user defined parameter of active channel — **MEASUREMENT (Ch 4)**

Syntax: `SXX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "11" for S11, "21" for S21, "22" for S22, "12" for S12.

T13 Select overlaid channel 1 and 3 display — **CHANNELS (Ch 4)**

Syntax: `T13`

Remarks: Restarts the sweep.

Related Commands: WFS, D13

T24 Select overlaid channel 2 and 4 display — **CHANNELS (Ch 4)**

Syntax: `T24`

Remarks: Restarts the sweep.

Related Commands: WFS, D24

TA2 Enter port 2 test attenuator value — **MEASUREMENT (Ch 4)**

Syntax: `TA2 val1 unit(s)`
Val 1: 0 to 40 in 10 dB steps
Units: DBL, DBM, XX1, XX3, XM3

Remarks: Attenuates the signal coming into port 2 (Option 6).

TA2? Output port 2 test attenuator value **MEASUREMENT (Ch 4)**

Syntax: `TA2?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0", "10", "20", "30", "40".

TBP Select time bandpass mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TBP`

Remarks: Selects time bandpass mode for the active channel.

Related Commands: CH1-CH4

TC1 Take calibration data for port 1 **CALIBRATION (Ch 5)**

Syntax: `TC1`

Related Commands: TC2, NCS, TCD

TC2 Take calibration data for port 2 **CALIBRATION (Ch 5)**

Syntax: `TC2`

Related Commands: TC1, NCS, TCD

TCD Take calibration data on one or both ports as necessary **CALIBRATION (Ch 5)**

Syntax: `TCD`

Related Commands: NC1, NC2, NCS

TCM Select the TRM calibration method **CALIBRATION (Ch 5)**

Syntax: `TCM`

Related Commands: LCM,OCM,SCM,CMX?

TDC Select time domain harmonic frequency calibration data points — CALIBRATION (Ch 5)

Syntax: `TDC`

Remarks: Required for low pass time/distance domain measurements. The resulting frequency sweep will consist of harmonic multiples of the start frequency. The Stop frequency is the start frequency times the number of data points selected up to the maximum instrument frequency.

Related Commands: NOC, DFC

TDDIST Set time domain parameter to distance for active channel — TIME DOMAIN (Ch 9)

Syntax: `TDDIST`

Related Commands: TDDIST?

TDDIST? Output active channel time domain parameter distance or time — TIME DOMAIN (Ch 9)

Syntax: `TDDIST?`

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for time or "2" for distance.

Related Commands: TDDIST, TDTIME

TDPI0 Turn phasor impulse response off for active channel — TIME DOMAIN (Ch 9)

Syntax: `TDPI0`

Related Commands: TDPI1

TDPI1 Turn phasor impulse response on for active channel — TIME DOMAIN (Ch 9)

Syntax: `TDPI1`

Related Commands: TDPI0

TDPIX? Output phasor impulse on/off status for active channel — TIME DOMAIN (Ch 9)

Syntax: TDPIX?

Data I/O: Outputs value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for off or "1" for on.

Related Commands: TDPI0, TDPI1

TDTIME Set time domain parameter to time for active channel — **TIME DOMAIN (Ch 9)**

Syntax: TDTIME

Related Commands: TDDIST, TDDIST?

TDX? Output domain mode for active channel — **TIME DOMAIN (Ch 9)**

Syntax: TDX?

Data I/O: Ouputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for frequency, "1" for frequency w/Gate, "2" for LP Impulse, "3" for LP Step, "4" for BP, "5" for BP Phasor Impulse.

TEB Select external trigger executes *DDT definition — **TRIGGERS (Ch 7)**

Syntax: TEB

Remarks: The instrument otherwise behaves as if in the internal triggering mode.

Related Commands: TIB, TIN, TEX, TXX?

TEX Select external measurement triggering — **MEASUREMENT (Ch 4)**

Syntax: TEX

Related Commands: TIN

TIB Select GPIB measurement triggering — **TRIGGERS (Ch 7)**

Syntax: TIB

Remarks: Receipt of a GPIB Group Execute Trigger causes the instrument to go to the next frequency and take a measurement. This is

similar to the action taken when the trigger mode is external and an external trigger is received.

Status Reporting: Sets the missed trigger bit (MGT) in the Limits Event Status Register if a Group Execute Trigger is received before completion of the previous trigger action.

Related Commands: TIN, TEB, TEX, TXX?

TIME Enter the system time **SYSTEM STATE (Ch 8)**

Syntax: `TIME val1, val2`
Val 1: val1 and val2 are in ASCII <NRF> format (paragraph 10-3)

Remarks: Val1 is the hour (1 - 24) and val2 is the minute (0 - 59). Notice the comma separator. This modifies the system time stored on the processor board.

Related Commands: DATE, DATE?, TIME?

TIME? Output the system time **SYSTEM STATE (Ch 8)**

Syntax: `TIME?`

Data I/O: The date is output as two ASCII <NR1> format (paragraph 10-3) numbers separated by a comma. The first is the hour (1 - 24) and the second is the minute (0 - 59).

Related Commands: DATE, DATE?, TIME

TIN Select internal measurement triggering **MEASUREMENT (Ch 4)**

Syntax: `TIN`

Related Commands: TEX

TK1 Select tracking mode **RECEIVER MODE (Ch 9)**

Syntax: `TK1`

Remarks: For service use only.

TLP Select time lowpass mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TLP`

Related Commands: TDC, CH1-CH4

TLZ Enter through line impedance for calibration **CALIBRATION (Ch 5)**

Syntax: `TLZ val1 unit(s)`
Val 1: 1.0 to 9999.99
Units: XX1, XX3, XM3, OHM

TOL Enter through offset length for calibration **CALIBRATION (Ch 5)**

Syntax: `TOL val1 unit(s)`
Val 1: -999.9999 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT

TPI Select time phasor impulse mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TPI`

Related Commands: CH1-CH4

TPN Enter pen number for trace overlay data **HARD COPY (Ch 8)**

Syntax: `TPN val1 unit(s)`
Val 1: 1 to 8
Units: XX1

TRCCOL Enter the color number for memory data **SYSTEM STATE (Ch 8)**

Syntax: `TRCCOL`
Val 1: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL?

TRCCOL? Output the color number for memory data **SYSTEM STATE (Ch 8)**

Syntax: `TRCCOL?`

Data I/O: Outputs the color palette number in ASCII <NR1> format.

Related Commands: ANNCOL?, DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL

TRS Trigger/restart sweep **MEASUREMENT (Ch 4)**

Syntax: `TRS`

Remarks: Restarts the sweep (continuous sweep mode) or triggers a single sweep (in hold mode).

Related Commands: WFS, HLD, CTN

TST Perform self test and output status (same as *TST?) **IEEE 488.2 (Ch 7)**

Syntax: `TST`

Remarks: Causes the VNA to perform an extensive, fully automated internal circuits self test. Detailed error messages indicating self test failures, if any, are placed in the service log in the order they occur. The query returns a "1" if any part of the self test failed, or a "0" when passed.

NOTE: When commands TST or *TST? are sent to the 37XXX, the VNA output power is momentarily set to the model-dependent Rated Power level during the self test. Ensure that any equipment connected to Port 1 or Port 2 will not be damaged by this power level.

Data I/O: Returns a value in ASCII format (paragraph 10-3).

Related Commands: ONE, OEL, OSL, PSL, *TST?

TXX? Output trigger source **MEASUREMENT (Ch 4)**

Syntax: `TXX?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for internal, "2" for external, "3" for GPIB.

Related Commands: TIN, TEX

U10 Select 10 mil UTF calibration kit **CALIBRATION (Ch 5)**

Syntax: `U10`

Related Commands: U15, U25

U15 Select 15 mil UTF calibration kit — CALIBRATION (Ch 5)

Syntax: `U15`

Related Commands: U10, U25

U25 Select 25 mil UTF calibration kit — CALIBRATION (Ch 5)

Syntax: `U25`

Related Commands: U10, U15

UNDOGC Exit gain compression and undo changes — GAIN COMPRESSION (Ch 9)

Syntax: `UNDOGC`

Remarks: Returns to the normal S parameter measurement state

Related Commands: SFGCA, SPGCA

UPL0 Turn upper limit off — LIMITS (Ch 6)

Syntax: `UPL0`

Related Commands: UPL1, LUP, LON, LOF

UPL1 Turn upper limit on at current value — LIMITS (Ch 6)

Syntax: `UPL1`

Related Commands: UPL0, LUP, LON, LOF

UPL20 Turn upper limit off for bottom graph — LIMITS (Ch 6)

Syntax: `UPL20`

Related Commands: UPL21, LUP2, LON, LOF

UPL21 Turn upper limit on at current value for bottom graph — LIMITS (Ch 6)

Syntax: UPL21

Related Commands: UPL20, LUP2, LON, LOF

UPL2X? Output upper limit on/off status for bottom graph — **LIMITS (Ch 6)**

Syntax: UPL2X?

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

Related Commands: UPL20, UPL21

UPLX? Output upper limit on/off status — **LIMITS (Ch 6)**

Syntax: UPLX?

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for OFF or "1" for ON.

US Suffix sets time data type and scales by 1E-6 — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: US

US1 Select upper segmented limit 1 as the active segment — **LIMITS (Ch 6)**

Syntax: US1

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US10 Select upper segmented limit 10 as the active segment — **LIMITS (Ch 6)**

Syntax: US10

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US2 Select upper segmented limit 2 as the active segment — **LIMITS (Ch 6)**

Syntax: `US2`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US3 Select upper segmented limit 3 as the active segment — LIMITS (Ch 6)

Syntax: `US3`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US4 Select upper segmented limit 4 as the active segment — LIMITS (Ch 6)

Syntax: `US4`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US5 Select upper segmented limit 5 as the active segment — LIMITS (Ch 6)

Syntax: `US5`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US6 Select upper segmented limit 6 as the active segment — LIMITS (Ch 6)

Syntax: `US6`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US7 Select upper segmented limit 7 as the active segment — LIMITS (Ch 6)

Syntax: `US7`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US8 Select upper segmented limit 8 as the active segment — **LIMITS (Ch 6)**

Syntax: `US8`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

US9 Select upper segmented limit 9 as the active segment — **LIMITS (Ch 6)**

Syntax: `US9`

Remarks: Makes USx the active segmented upper limit.

Related Commands: CH1-CH4, LS1-LS10, LSx?

USC Suffix sets time data type and scales by 1E-6 — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `USC`

USE Enter effective dielectric for microstrip calibration — **CALIBRATION (Ch 5)**

Syntax: `USE val1 unit(s)`
Val 1: 1.0 to 9999.99
Units: XX1, ,X3, M3

Related Commands: USW, USZ

USL Enter label string for user parameter being defined — **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USL "label string"`
Val 1: Label string is a maximum of five characters. Displays on the screen.

Related Commands: USL?

USL? Output label string for user parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USL?`

Data I/O: String is output in <Arbitrary ASCII> format (paragraph 10-3)

Block Size: 5 bytes maximum

Related Commands: USL

USR1 Measure user parameter 1 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR1`

Remarks: USR1 takes the place of S21. Any channel displaying S21 will now display USR1.

Related Commands: USR2, USR3, USR4, S11, S21, S12, S22

USR2 Measure user parameter 2 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR2`

Remarks: USR2 takes the place of S11. Any channel displaying S11 will now display USR2.

Related Commands: USR1, USR3, USR4, S11, S21, S12, S22

USR3 Measure user parameter 3 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR3`

Remarks: USR3 takes the place of S12. Any channel displaying S12 will now display USR3.

Related Commands: USR1, USR2, USR4, S11, S21, S12, S22

USR4 Measure user parameter 4 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR4`

Remarks: USR4 takes the place of S22. Any channel displaying S22 will now display USR4.

Related Commands: USR1, USR2, USR3, S11, S21, S12, S22

USW Enter microstrip width for microstrip calibration — **CALIBRATION (Ch 5)**

Syntax: `USW val1 unit(s)`
Val 1: 0.001 mm to 1.0 m
Units: M, MTR, MM, MMT, CM, CMT

Related Commands: USE, USZ

USZ Enter microstrip impedance for microstrip calibration — **CALIBRATION (Ch 5)**

Syntax: `USZ val1 unit(s)`
Val 1: 1.0 to 9999.99
Units: XX1, XX3, XM3, OHM

Related Commands: USE, USW

V Suffix sets voltage data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `V`

V15 Set Millimeter Wave Band to V Band (WR-15) — **MILLIMETER WAVE (Ch 9)**

Syntax: `V15`

VLT Suffix sets voltage data type — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `VLT`

VSP Enter rear panel stop voltage value — **REAR PANEL OUTPUT (Ch 9)**

Syntax: `VSP ,all ,unit(s)`
Val 1: 00.000 to +10.000 volts
Units: V, VLT

Related Commands: VST

VSP? Output rear panel stop voltage value — **REAR PANEL OUTPUT (Ch 9)**

Syntax: `VSP?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

VST Enter rear panel start voltage value — REAR PANEL OUTPUT (Ch 9)

Syntax: `VST val1 unit(s)`
Val 1: 00.000 to +10.000 volts
Units: V, VLT

Related Commands: VSP

VST? Output rear panel start voltage value — REAR PANEL OUTPUT (Ch 9)

Syntax: `VST?`

Data I/O: Outputs a value in ASCII <NR3 > format (paragraph 10-3).

W10 Set Millimeter Wave Band to W Band (WR-10) — MILLIMETER WAVE (Ch 9)

Syntax: `W10`

W10E Set Millimeter Wave Band to extended W Band (WR-10E) — MILLIMETER WAVE (Ch 9)

Syntax: `W10E`

WCO Enter waveguide cutoff frequency for user defined kit — CALIBRATION (Ch 5)

Syntax: `WC0 val1 unit(s)`
Val 1: 0 to current start frequency
Units: HZ, KHZ, MHZ, GHZ

WFS Wait full sweep until all display data is valid — MEASUREMENT (Ch 4)

Syntax: `WFS`

Remarks: This command is useful before autoscaling, normalizing, or finding the minimum/maximum values (with markers). It is required when outputting data from the 37XXX to ensure that all data points in the sweep are valid. WFS is effective for dual sweeps containing forward and reverse parameters and also for insuring time domain processing is complete.

Status Reporting: Sets bit 4 in the Extended Event Status Register when complete.

Related Commands: TRS, HLD

WIDE Use entire display width for graphs — SYSTEM STATE (Ch 8)

Syntax: `WIDE`

WKD Select user defined waveguide calibration kit — CALIBRATION (Ch 5)

Syntax: `WKD`

Related Commands: WKI

WKI Select installed waveguide calibration kit — CALIBRATION (Ch 5)

Syntax: `WKI`

Related Commands: WKD

WLS Select low sidelobe window shape — TIME DOMAIN (Ch 9)

Syntax: `WLS`

Related Commands: WMS, WNM, WRT, CH1-CH4

WMS Select minimum sidelobe window shape — TIME DOMAIN (Ch 9)

Syntax: `WMS`

Related Commands: WLS, WMS, WRT, CH1-CH4

WNM Select nominal window shape — TIME DOMAIN (Ch 9)

Syntax: `WNM`

Related Commands: WLS, WMS, WRT, CH1-CH4

WRT Select rectangular window shape — TIME DOMAIN (Ch 9)

Syntax: `WRT`

Related Commands: WLS, WMS, WRT, CH1-CH4

WSH1 Enter waveguide short offset 1 for user defined kit — CALIBRATION (Ch 5)

Syntax: `WSH1 val1 unit(s)`
Units: -999.999 to +999.999

Remarks: M, CM, MM

WSH2 Enter waveguide short offset 2 for user defined kit — **CALIBRATION (Ch 5)**

Syntax: `WSH2 val1 unit(s)`
Val 1: -999.999 to +999.999
Units: M, CM, MM

Related Commands: WSH1

WSX? Output window shape — **TIME DOMAIN (Ch 9)**

Syntax: `WSX?`

Remarks: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "1" for rectangular, "2" for nominal, "3" low sidelobe, "4" for minimum sidelobe.

XM3 Suffix sets unitless data type and scales by 1E-3 — **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `XM3`

XMKR? Output marker mode — **MARKERS (Ch 6)**

Syntax: `XMKR?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for Markers on active channel mode, "1" for Active marker all channels mode, "2" for Filter parameter measurement Mode, "3" for Marker search marker mode.

Related Commands: AMKR, FMKR, NMKR, SMKR

XSB? Output byte order for output data LSB or MSB — **DATA TRANSFER (Ch 7)**

Syntax: `XSB?`

Data I/O: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: "0" for LSB or "1" for MSB.

Related Commands: LSB, MSB

XX1 Suffix sets unitless data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `XX1`

XX3 Suffix sets unitless data type and scales by 1E3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `XX3`

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZSN, ZSP, ZCT, MRR

ZCT Enter zoom range center value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZCT val1 unit(s)`
Val 1: -999.999 to +999.999
Units: PSC, NSC, USC, PS, NS, MS, S, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZSN, ZSP, ZST, MRR, ZCT?

ZCT? Output zoom range center value **TIME DOMAIN (Ch 9)**

Syntax: `ZCT?`

Data I/O: Outputs value in ASCII <NR3> format.

Related Commands: ZCT

ZSN Enter zoom range span value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZSN val1 unit(s)`
Val 1: 0 to 999.999
Units: PSC, NSC, S, US, USC, PS, NS, MS, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZCT, ZSP, ZST, ZSN?

ZSN? Output zoom range span value **TIME DOMAIN (Ch 9)**

Syntax: `ZSN?`

Data I/O: Outputs value in ASCII <NR3> format.

Related Commands: ZSN

ZSP Enter zoom range stop value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZSP val1 unit(s)`
Val 1: -999.999 to +999.999
Units: PSC, NSC, S, US, USC, PS, NS, MS, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZSN, ZCT, ZST, MRR, ZSP?

ZSP? Output zoom range stop value **TIME DOMAIN (Ch 9)**

Syntax: `ZSP?`

Data I/O: Outputs value in ASCII <NR3> format.

Related Commands: ZSP

ZST Enter zoom range start value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZST val1 unit(s)`
Val 1: -999.999 to +999.999
Units: PSC, NSC, S, US, USC, PS, NS, MS, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

ZST? Output zoom range start value **TIME DOMAIN (Ch 9)**

Syntax: `ZST?`

Data I/O: Outputs value in ASCII <NR3> format.

Related Commands: ZST

Table 10-1. Calibration Coefficient (Error Term) Input/Output Ordering by Calibration Type

Calibration (Related Commands)**	Calibration Coefficient (Error Term)*											
	1	2	3	4	5	6	7	8	9	10	11	12
12-Term (C12, A12)	EDF	ESF	ERF	ETF	ELF	EXF	EDR	ESR	ERR	ETR	ELR	EXR
1 Path 2 Port FWD (C8T, A8T)	EDF	ESF	ERF	ETF	EXF							
1 Path 2 Port REV (C8R, A8R	EDR	ESR	ERR	ETR	EXR							
Reflection Only Port 1 (CRF, ARF)	EDF	ESF	ERF									
Reflection Only Port 2 (CRR, ARR)	EDR	ESR	ERR									
Reflection Only Both Ports (CRB, ARB)	EDF	ESF	ERF	EDR	ESR	ERR						
Transmission Frequency Response FWD (CFT, AFT)	ETF	EXF										
Transmission Frequency Response REV (CRT, ART)	ETR	EXR										
Transmission Frequency Response FWD&REV (CBT, ABT)	ETF	EXF	ETR	EXR								

* See OCx and ICx Series commands.

** The commands listed in parenthesis are used to set and/or simulate calibration process (refer to Chapter 5, Calibration).

Table 10-2. Output Values and Graph Display Types

Graph Display Type (OFF Command)	Units per Division	Reference Value	Related Suffix Units*
Log magnitude	0.001–50	–999.999 to +999.999	DB
Phase	0.01–45	–999.999 to +999.999	
–360 to +360	DEG, RAD		
Log mag & phase	0.001–50,		
0.01–45	–999.999 to +999.999		
–360 to +360	DB,		
DEG, RAD			
Linear magnitude	1E12 to –999.999	–999.999 to +999.999	V, XX1, XX3, XM3
Linear mag & phase	1E12 to –999.999		
0.01–454	–999.999 to +999.999		
–360 to +360	V, XX1, XX3, XM3		
DEG, RAD			
Smith chart	–3, 0, 10, 20, 30	N/A	DB
Inverted Smith	–3, 0, 10, 20, 30	N/A	DB
Group delay	1E15 to 999.999 sec	999.999 sec	SEC, MS, US, NS, PS
Log polar	0.001–50,		
–360 to +360	0.001–50,		
–999.999 to –999.99	DB		
DEG, RAD			
Linear polar	1E–12 to 200,		
–360 to +360	5E–12 to 200,		

Table 10-3 *Color Palette Numbers to be used with Model 37XXX*

Palette No.	Color	Palette No.	Color	Palette No.	Color
0	Black	16	Goldenrod	32	Cyan
1	Dim Grey	17	Med. Goldenrod	33	Cadet Blue
2	Light Grey	18	Wheat	34	Sky Blue
3	Grey	19	Khaki	35	Steel Blue
4	Salmon	20	Yellow Green	36	Slate Blue
5	Firebrick	21	Green Yellow	37	Blue
6	Brown	22	Pale Green	38	Medium Blue
7	Pink	23	Lime Green	39	Blue Violet
8	Orange red	24	Green	40	Medium Orchid
9	Orange	25	Spring Green	41	Thistle
10	Red	26	Forest Green	42	Plum
11	Coral	27	Sea Green	43	Magenta
12	Gold	28	Aquamarine	44	Purple
13	Sienna	29	Med. Aquamarine	45	Maroon
14	Tan	30	Turquoise	46	Violet red
15	Yellow	31	Dark Turquoise	47	White

Chapter 11
Instrument Data

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Chapter 11
Instrument Data

11-1 INTRODUCTION

This chapter provides general tabular information for the Model 37XXX VNA. Much of this information is presented in previous chapters, but is repeated here for easy access. The subject of each table in this chapter is listed on the chapter Contents page.

11-2 GPIB RESET CONFIGURATION

The 37XXX will be set to the default front panel setup conditions listed in Table 11-1 upon receipt of the *RST common command. Additionally, GPIB Remote-Only functions are set or cleared as listed in Table 11-2.

Table 11-1. *Default Front Panel Settings (1 of 2)*

Function	Default Setting
Active Menu	Sweep Setup
Measurement	*Maximum Sweep Range:* Model Dependent *Source Power:* Model Dependent *Data Points:* Normal (401 points) *Measurement:* Sweep Mode, restarted *Hold:* Hold/Continue, RF and bias off in hold mode
Channel	Quad (four-channel) display Channel 1 active
Display	*Channel 1:* S11, 1:1 Smith Chart *Channel 2:* S12, Log Magnitude and Phase *Channel 3:* S21, Log Magnitude and Phase *Channel 4:* S22, 1:1 Smith Chart *Scale:* 10 dB/Division or 90°/Division *Offset:* 0.000dB or 0.00 degree *Reference Position:* Midscale *Electrical Delay:* 0.00 seconds *Dielectric:* Air (1.000649) *Normalization:* Off *Normalized Trace Data:* Erased
Enhancement	*Video IF Bandwidth:* Normal *Averaging:* Off, 1 average *Smoothing:* Off, 0%
Calibration	*Correction:* Off and Calibration erased *Trace Mode:* Off *Connector:* Model dependent *Load:* Broadband

Table 11-1. *Default Front Panel Settings (2 of 2)*

Function	Default Setting
Markers/Limits	*Markers On/Off:* All off *Markers Enabled/Disabled:* All enabled Marker Frequency: All set to the start-sweep frequency (or start -time distance Δ *Reference:* Off *Limits:* All set to reference position value
System State and Save/Recall	*Identification and Options Data:* Unchanged *GPIB Addresses:* Unchanged *Frequency Blanking :* Disengaged, *Internal Memory Saved:* Unchanged *Installed Cal Coefficients:* Unchanged
Output	*Output Type:* Printer (full screen, clear headers) *Marker and Sweep Data:* Enabled *Printout:* Every point *Headers:* Cleared and disabled
Diagnostics	*Service Log/Error Messages:* Unchanged *Internal Hardware Calibrations Data:* Unchanged *Troubleshooting:* Recovered from (that is, turned off)
Triggering	*Mode:* Internal *Automatic I.F. Cal:* On

Table 11-2. *GPIB Remote-Only Functions Status*

Memories Saved:	Memories Cleared/Changed:
*Information reported via the *IDN? and *OPT? query commands.* SRQ Standard Event Status Extended Event Status Limits Pass/Fail Status Enable Registers Standard, Extended, And Limits GPIB Input and Output Buffers	Trigger action for *TRG and Group Execute Trigger is set to null. Operation Complete State: Idle Data Transfer Format Defaults: FMA, MSB, DPR0

11-3 CALIBRATION COEFFICIENTS

Table 11-3 lists the calibration coefficients that are generated during the 37XXX calibration process using the Calibration Coefficients Commands (OCx - 1Cx). Refer to Chapter 7, "Calibration Coefficients Data Transfer."

Table 11-3. *Calibration Coefficient (Error Term) Input/Output Ordering by Calibration Type*

Calibration (Related Commands)**	Calibration Coefficient (Error Term)*											
	1	2	3	4	5	6	7	8	9	10	11	12
12-Term (C12, A12)	EDF	ESF	ERF	ETF	ELF	EXF	EDR	ESR	ERR	ETR	ELR	EXR
1 Path 2 Port FWD (C8T, A8T)	EDF	ESF	ERF	ETF	EXF							
1 Path 2 Port REV (C8R, A8R	EDR	ESR	ERR	ETR	EXR							
Reflection Only Port 1 (CRF, ARF)	EDF	ESF	ERF									
Reflection Only Port 2 (CRR, ARR)	EDR	ESR	ERR									
Reflection Only Both Ports (CRB, ARB)	EDF	ESF	ERF	EDR	ESR	ERR						
Transmission Frequency Response FWD (CFT, AFT)	ETF	EXF										
Transmission Frequency Response REV (CRT, ART)	ETR	EXR										
Transmission Frequency Response FWD&REV (CBT, ABT)	ETF	EXF	ETR	EXR								

* See OCx and ICx Series commands.

** The commands listed in parenthesis are used to set and/or simulate calibration process (refer to Chapter 5, Calibration).

11-4 NUMERIC DATA SUFFIX MNEMONICS

Table 11-4 lists the numeric data suffix mnemonics for the Model 37XXX VNA. These mnemonics are used when entering numeric data with GPIB commands (usage of these codes is optional). Refer to Chapter 4, "Data Entry Suffix Codes".

Table 11-4. Numeric Data Suffix Mnemonics

Code	Parameter Type	Weighting Factor	Code	Parameter Type	Weighting Factor
DB, DBL, DBM	Power	1.0	NS, NSC	Time	10E-9
DEG	Phase	1.0	PS, PSC	Time	10E-12
RAD	Phase	180/π	M, MTR	Distance	1.0
HZ	Frequency	1.0	CM, CMT	Distance	10E-2
KHZ	Frequency	10E+3	MM, MMT	Distance	10E-3
MHZ	Frequency	10E+6	OHM	Impedance	1.0
GHZ	Frequency	10E+9	V, VLT	Voltage	1.0
REU	Real	1.0	MV	Voltage	10E-3
IMU	Imaginary	1.0	XM3	Unitless	10E-3
S	Time	1.0	XX1	Unitless	1.0
MS	Time	10E-3	XX3	Unitless	10E+3
US, USC	Time	10E-6			

11-5 OUTPUT VALUES AND GRAPH DISPLAY TYPES

Table 11-5 lists the various characteristics that are related to the different graph types used by the 37XXX screen displays. This information relates to various input commands described throughout Chapters 4 through 9.

Table 11-5. *Graph Display Type Related Data*

Graph Display Type	Units per Division	Reference Value (OFF Command)	Related Suffix Units*
Log magnitude	0.001–50	–999.999 to +999.999	DB
Phase	0.01–45	–999.999 to +999.999 –360 to +360	DEG, RAD
Log mag & phase	0.001–50, 0.01–45	–999.999 to +999.999 –360 to +360	DB, DEG, RAD
Linear magnitude	$1E^{12}$ to –999.999	–999.999 to +999.999	V, XX1, XX3, XM3
Linear mag & phase	$1E^{12}$ to –999.999 0.01–454	–999.999 to +999.999 –360 to +360	V, XX1, XX3, XM3 DEG, RAD
Smith chart	–3, 0, 10, 20, 30	N/A	DB
Inverted Smith	–3, 0, 10, 20, 30	N/A	DB
Group delay	$1E^{15}$ to 999.999 sec	999.999 sec	SEC, MS, US, NS, PS
Log polar	0.001–50, –360 to +360	0.001–50, –999.999 to –999.99	DB DEG, RAD
Linear polar	$1E^{-12}$ to 200, –360 to +360	$5E^{-12}$ to 200, –360 to +360	V, XX1, XX3, XM3 DEG, RAD
Real	$1E^{-12}$ to +999.999	–999.999 to +999.999	REU
Imaginary	$1E^{-12}$ to +999.999	–999.999 to +999.999	IMU
Real & Imaginary	$1E^{-12}$ to +999.999	–999.999 to +999.999	REU IMU
SWR	$1E^{-12}$ to +999.999	0 to $1E^{6}$	XX1, XX3, XM3

* Suffixes may be used for data input commands, i.e. scale or limit line setting commands.
RAD suffix equates to 180/π degrees

11-6 COLOR PALETTE NUMBERS

Table 11-6 lists the Color Palette numbers (codes) that are used with the GPIB commands that control data graph and menu colors for 37XXX screen displays. Refer to Chapter 8, System State, Colorization.

Table 11-6 Color Palette Numbers to be used with Model 37XXX

Palette No.	Color	Palette Number	Color	Palette No.	Color
0	Black	16	Goldenrod	32	Cyan
1	Dim Grey	17	Med. Goldenrod	33	Cadet Blue
2	Light Grey	18	Wheat	34	Sky Blue
3	Grey	19	Khaki	35	Steel Blue
4	Salmon	20	Yellow Green	36	Slate Blue
5	Firebrick	21	Green Yellow	37	Blue
6	Brown	22	Pale Green	38	Medium Blue
7	Pink	23	Lime Green	39	Blue Violet
8	Orange red	24	Green	40	Medium Orchid
9	Orange	25	Spring Green	41	Thistle
10	Red	26	Forest Green	42	Plum
11	Coral	27	Sea Green	43	Magenta
12	Gold	28	Aquamarine	44	Purple
13	Sienna	29	Med. Aquamarine	45	Maroon
14	Tan	30	Turquoise	46	Violet red
15	Yellow	31	Dark Turquoise	47	White

Chapter 12
Error Messages

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Chapter 12
Error Messages

12-1 INTRODUCTION

This chapter provides a listing of error messages that appear on the 37XXX display or that are written to the internal software Service Log.

12-2 OPERATIONAL ERROR MESSAGES

Table 12-1 provides a listing and description of the operational error messages. For the most part, these errors are displayed only on the 37XXX display and are caused by incorrectly operating the 37XXX.

12-3 DISK RELATED ERROR MESSAGES

Table 12-2 provides a listing and description of the disk-related-error messages. The numbered errors in this group are also written to the Service Log, since they may indicate system problems.

12-4 GPIB RELATED ERROR MESSAGES

Table 12-3 provides a listing and description of GPIB-related error messages. These errors are entered in the Service Log and output as part of the response of OGE/OGL commands.

12-5 SERVICE LOG ERROR MESSAGES

Table 12-4 provides a listing of the error messages that are written to the internal system service log. These messages are mostly hardware related. Because they may warn of system problems, you should refer to the 37XXX Maintenance Manual for further action by a qualified service engineer. Some of these messages may occur as a result of incorrectly programming the 37XXX. This includes the GPIB errors, 7204–7207, and errors in the 5000 range, RF Power. The RF Power errors may be triggered when setting the 37XXX power to a value greater than its reset level. This feature of the 37XXX lets you take advantage of all available power; however, accuracy cannot be guaranteed when power is unleveled.

Table 12-1. Operational Error Messages (1 of 2)

Error Message	Description	Corrective Action
ATTENUATOR UNAVAILABLE	Option 6 Port 2 Test Step Attenuator is not installed.	Install Option 6 Step Attenuator,
DIFFERENT H/W SETUP. RECALL ABORTED	Model and/or options is (are) different from the recalled setup.	Reconfigure system to duplicate the hardware setup that was used to store the saved data.
DIFFERENT S/W VERSION, RECALL ABORTED	Saved state not compatible with software version or options.	Load compatible software (S/W) version and retry.
FREQUENCIES HAVE REACHED UPPER LIMIT	Frequencies being defined in Multiple Source mode have reached upper limits of Sources.	Redefine frequencies to not exceed limits of Sources.
MEMORY LOCATION CORRUPTED	Requested memory location is corrupted.	None. If problem reoccurs after storing a new setup, contact WILTRON Customer Service.
NO BANDS ARE STORED	No frequency bands have been defined and stored.	Define and store frequency bands to turn on Multiple Source mode.
NO STORED MEMORY DATA	No data is stored in memory for display or trace math.	Store or re-save measurement data.
OPTION NOT INSTALLED	Selected an option that is not installed.	None.
OUT OF CAL RANGE	Entered values out of the selected calibration range.	Change calibration range or re-enter values that are within the current range.
OUT OF H/W RANGE	Entered value is out of the instrument's hardware range.	Re-enter values that are within range.
OUT OF RANGE	Entered value is out of range.	Re-enter values that are within range.
RECEIVER OUT OF RANGE BY EQUATION	Equation defined in Multiple Source mode places receiver frequency out of range when attempting to store band.	Redefine frequency.
SOURCE 1 OUT OF RANGE BY EQUATION	Equation defined in Multiple Source mode places Source 1 frequency out of range when attempting to store band.	Redefine frequency.
SOURCE 2 OUT OF RANGE BY EQUATION	Equation defined in Multiple Source mode places Source 2 frequency out of range when attempting to store band.	Redefine frequency.

Table 12-1. Operational Error Messages (2 of 2)

Error Message	Description	Corrective Action
STANDARD CAL NOT VALID FOR WAVEGUIDE	Cannot use the standard method when calibrating with waveguide.	Use the Offset Short method with waveguide.
START F FOLLOWS PREVIOUS STOP F	Start frequency of current band immediately follows stop frequency of previous band. Cannot be modified.	None.
START MUST BE LESS THAN STOP	Entered start frequency is greater than the stop frequency.	Re-enter frequency values such that the start frequency is lower than the stop frequency.
STEP IS TOO LARGE	Entered harmonic frequency extends the stop out of range.	Re-enter so that harmonic frequency is within range.
STOP IS OVER RANGE	Entered value exceeds the instrument's stop frequency.	Re-enter stop frequency.
SYSTEM NOT CALIBRATED	37XXX is uncalibrated for the selected measurement values.	Perform a measurement calibration.
TOO FEW POINTS, 2 MINIMUM	Entered too few discrete fill points, 2 is minimum.	Re-enter data points.
TOO MANY POINTS, 1601 MAXIMUM	Entered too many discrete fill points, 1601 points are the maximum allowed.	Re-enter data points.
UNDEFINED DIVIDE BY ZERO	Denominator cannot be zero in equation.	Make denominator a value other than zero.
WINDOW TOO SMALL	Attempted to set time domain range smaller than allowed	Re-enter larger time range.
OUT OF WINDOW RANGE	Attempted to set time domain range larger than allowed	Re-enter values within allowed range.

Table 12-2. Disk-Related-Error Messages (1 of 1)

Error Message	Description	Corrective Action
7140 GENERAL FLOPPY DRIVE FAIL	Invalid disk media or format.	Use 1.44 MB diskette and/or format in the 37XXX.
7142 FLOPPY DISK READ ERROR	Read error when accessing disk file.	Use 1.44 MB diskette and/or format in the 37XXX.
7143: FLOPPY DISK WRITE ERROR	Error in writing to disk file.	Use 1.44 MB diskette and/or format in the 37XXX.
7147 FLOPPY DISK UNAVAILABLE	Floppy disk is not available.	Install floppy diskette and/or check floppy disk drive.
7170: GENERAL HARD DISK FAIL	General error in accessing hard disk.	Retry and if still fails, reformat the hard disk drive and/or check floppy disk drive.
7172: HARD DISK READ ERROR	Read error when accessing disk file.	Retry and if still fails, reformat the hard disk drive and/or check floppy disk drive.
7173: HARD DISK WRITE ERROR	Error in writing to disk file.	Retry and if still fails, reformat the hard disk drive and/or check floppy disk drive.
7177: HARD DISK UNAVAILABLE	Hard disk is not available.	Install hard disk drive and/or check operation of hard disk.
8140: GENERAL DISK BUFFER ERROR	Out of RAM.	Press the System State, Default Program key, and retry. This will reset the 37XXX to the factory default state.
FILE NOT FOUND	Disk file not found.	None.
FLOPPY DISK HAS NO ROOM FOR FILE	Floppy diskette is full.	Delete files or install new diskette.
FLOPPY DISK NOT READY	Floppy disk is not ready (or not installed.).	Install diskette in floppy drive.
FLOPPY DISK WRITE PROTECTED	Write protect tab in place on floppy diskette.	Remove write-protect tab.
HARD DISK HAS NO ROOM FOR FILE, DELETE EXISTING FILES(S) TO CREATE SPACE	Hard disk is full.	Delete unneeded files.

Table 12-3. GPIB-Related Error Messages (1 of 8)

Error Message	Description
These errors are entered in the Service Log and output as part of the response of OGE/OGL commands for GPIB commands. The list is subdivided into the type of GPIB error: 7204..., 7205..., 7206..., and 7207.	
7204 GPIB COMMAND ERROR DESCRIPTIONS	
Faulty program mnemonic syntax	Generated when the program mnemonic found was not one of the currently defined program mnemonics for the 37XXX.
Faulty suffix mnemonic syntax	Generated when the suffix mnemonic found was not one of the currently defined suffix mnemonics for the 37XXX.
Faulty mnemonic syntax	Generated when the mnemonic found was not one of the currently defined program or suffix mnemonics for the 37XXX.
Missing Program Message Separator	Generated when the required semicolon preceding the next program mnemonic was not found.
Expected NRf data	Generated when a mnemonic is used that requires a trailing NRf numeric data element. The data element was either missing or the first character of the data element was not one of the acceptable NRf characters.
NRf mantissa too long	The maximum allowable number of characters in the NRf numeric element mantissa is 255.
Exponent magnitude too large	The maximum allowable exponent magnitude in an NRf element is +/— 32000.
Faulty NRf syntax	Can be any number of syntactical errors such as more than one decimal point, inclusion of a decimal point in the exponent field, an invalid character imbedded in the numeric or no exponent value following the 'E'.
Expected String Program Data	Generated when a mnemonic is used that requires a trailing string data element. The date element was either missing or no open quote character was found.
Missing close quote character	Generated when a mnemonic is used that requires a trailing string data element. The open quote character was found, but the close quote character was not.
Expected Arbitrary Block data	Generated when a mnemonic is used that requires a trailing arbitrary block data element and the trailing element was not an arbitrary block data element. Or in some cases, the arbitrary block was empty.
Faulty Arbitrary Block	Generated when a defined length arbitrary block data element is terminated early with an EOI or an indefinite length arbitrary block data element is not properly terminated.
Missing Program Data Separator	Two data elements of a program mnemonic that requires multiple program data elements, are not properly separated from each other by a comma.
GET received during PM reception	Generated when the GPIB Command 'Group Execute Trigger' is received during the reception of a program message but before its proper termination with the end message. The partial program message up to but not including the 'Group Execute Trigger' will be executed. Execution of the Group Execute Trigger and any subsequent program message elements received before the end message will be skipped.

Table 12-3. GPIB-Related Error Messages (2 of 8)

Error Message	Description
7205 GPIB EXECUTION ERROR DESCRIPTIONS	
Not permitted in a DDT command sequence	When executing a defined device trigger command sequence, a forbidden command was detected.
Too much Arbitrary Block data	The arbitrary block supplied contained more data than was necessary for the currently defined 37XXX state. This can occur when graph types, start/stop frequencies or data points are changed.
Insufficient Arbitrary Block data	The arbitrary block supplied did not have enough data for the currently defined 37XXX state. This can occur when graph types, start/stop frequencies or data points are changed.
Invalid parameter for current graph type	An attempt was made to program a non-existent parameter for the current graph type. For instance, a Smith chart does not have a reference or reference line position (mnemonics OFF and REF).
Parameter out of range	An attempt was made to program an out of integer range value for a parameter. This error is detected by the GPIB MANAGER when converting and rounding to the appropriate integral size (signed/unsigned char/short or long).
Parameter value not permitted	A parameter value was not found in the list of permissible values for that parameter.
CW marker sweep not permitted in time domain	The mnemonics M1C, M2C, M3C, M4C, M5C and M6C are forbidden in time domain.
Parameter unavailable in frequency domain	The mnemonic ODV and OTV are forbidden in frequency domain.
Port 2 Test Attenuator (OPT 6) not installed	The mnemonic TA2 is forbidden when the attenuator is not installed.
Time Domain (OPT 2) not installed	An attempt was made to use one of the time domain mnemonics when the option is not installed.
Return to Local not permitted in Local Lockout	The mnemonic RTL failed due to being in the Local Lockout mode.
Calibration does not exist	An attempt was made to turn on flat power correction or vector error correction when the corresponding calibration does not exist.
Cal term not available	An attempt was made to get a calibration term which does not exist for the current calibration type.
Invalid cal term for calibration type	An attempt was made to program a calibration term which does not exist for the current calibration type.
Front panel setup not valid	An attempt was made to get a front panel setup that did not contain a correct/valid state.

Table 12-3. GPIB-Related Error Messages (3 of 8)

Error Message	Description
Normalization data not valid	An attempt was made to reference normalization data when there was no normalization data currently stored.
Command sequence too long	An attempt was made to define a device trigger command sequence which had more than 255 characters.
Unable to display menu	An attempt was made to display a menu which could not be displayed for the current 37XXX state.
String too long	An attempt was made to enter a string for the following mnemonics which exceeded the specified maximum length. LID, LMS and LNM - maximum length is 15 characters. LOC - maximum length is 79 characters.
Must specify a calibration type first	In order to perform a calibration, the calibration type must be specified by the use of one of the Cxx mnemonics (i.e. C12, C8T, etc.) PRIOR to the issuance of the mnemonics CWC, TDC or BEG.
Parameter value unchanged	An attempt was made to change a start/stop frequency or number of data points to a value outside of the current calibrated range with correction turned on.
Parameter change not permitted	An attempt was made to perform an illegal state change or action based on the current 37XXX state. This includes attempting to store an undefined band definition. Or certain changes from the calibration state or the calibration define state when defining discrete frequencies.
Parameter value out of range Parameter out of hardware range	An attempt was made to set a parameter to a value outside of the permissible range of values for the parameter.
Standard cal method not valid for waveguide	In a waveguide type of calibration, the standard (OSL) cal method is forbidden.
Out of calibrated range	An attempt was made to change a parameter not permitted to be changed with correction on.
Start must be must be less than stop	An attempt was made to set a new start frequency, distance or time greater than or equal to the current stop frequency, distance or time. Or to set a new stop frequency, distance or time less than or equal to the current start frequency, distance or time.
Tune mode requires a 12 term calibration	Perform a 12 term calibration prior to turning on tune mode.
Current and cal frequencies different	The flat power calibration setup does not match the current setup.
Stored data is invalid	An attempt was made to reference normalized data when normalized data was invalid.

Table 12-3. GPIB-Related Error Messages (4 of 8)

Error Message	Description
Parameter change not permitted on current state	An attempt was made to change a parameter while IF cal was active. It is not expected that this message will ever be seen. If you see this message, notify the factory.
Calibration may not be valid	An attempt was made to repeat the previous calibration when there was no record of a previous calibration.
Calibration does not exist	An attempt was made to turn on flat power correction or vector error correction when the corresponding calibration does not exist.
Current calibration is erased	When turning on Multiple Source Mode with vector error correction on, the calibration is destroyed. Not really an error. Message is issued as a warning.
Time Domain and CW mode not permitted	An attempt was made to turn on a time domain mode in CW. This is not permitted.
Not permitted in Time Domain	An attempt was made to select a group delay display or CW mode when in time domain mode or to select a dual overlay display with a frequency/time domain mismatch.
Time Domain not allowed	An attempt was made to turn on a time domain mode but the current 37XXX state does not permit it.
Permitted only in diagnostic mode	Must put the 37XXX into the diagnostics mode via the SDG command before using this mnemonic.
Graph types not appropriate for dual overlay	While in dual overlay mode, and attempt was made to change one of the active graph types to a type which conflicts with dual overlay, or to change one of the active channels into or out of time domain which sets up a dual overlay conflict. Or an attempt was made to select dual overlay mode when there would be a graph type conflict for a frequency/time domain conflict.
New Discrete Fill not allowed in current state	Cannot set up a new discrete fill definition while performing a calibration or when correction is turned on. Also cannot do this when group delay is the graph type on the active channel.
Low Pass mode requires a harmonic sweep	Perform a TD harmonic sweep calibration prior to using this mnemonic.
Receiver out of range by equation	Problems with the internal source, external source or receiver equations in multiple source mode.
New start less than previous stop	An attempt was made to set the start frequency for the new multiple source mode band definition to a frequency less than the stop frequency of the previous band.
Bad filename	The supplied filename was bad. The filename can have 8 characters maximum. No extensions. The filename must start with and alpha type character (A thru Z). After that the allowable characters are alpha, numeric (0 thru 9) and underscore (_).
Conflict with rotary knob	You should not be using the rotary knob and the GPIB at the same time.

Table 12-3. GPIB-Related Error Messages (5 of 8)

Error Message	Description
Too many data points for external source	A 6700B series external source can handle 501 data points. A 68000 series external source can handle 999 data points.
Recalled setup corrupted Hardware mismatch in recalled setup Software mismatch in recalled setup	These are problems with the recalled setup.
Too many data points for Discrete Fill	The maximum number of data points in discrete fill is 1601.
Not enough data points for Discrete Fill	The minimum number or data points in discrete fill is 2.
Discrete Fill end frequency out of range	The number of points for discrete fill puts the end frequency out of range.
Step is too large	When setting up a time domain harmonic sweep, cannot get 2 data points because the start frequency is too high for the approximate stop frequency. In a group delay display, the delay aperture percent of sweep is less than one step size.
Range too small	An attempt was made to set a distance or time span value too small. This can also be done via inappropriate values for start and stop.
Start or stop out of range	An attempt was made to set a distance or time start or stop value out of range. This can also be done via inappropriate values for center and span.
No bands defined	An attempt was made to turn on multiple source mode with no band definitions.
Out of frequencies for new band definition Source out of range by equation External source out of range by equation	The current set of multiple source mode bands use up all the frequency range of the 37XXX. Therefore, no more bands can be defined.
File is read only	An attempt was made to write to a write protected file.
File not found	An attempt was made to access a non-existent file.
Floppy drive not ready	An attempt was made to access the floppy drive with no floppy disk installed.
Floppy disk full Hard disk full	An attempt was made to write to a floppy disk or the hard disk when no space was left on the disk.
Floppy disk write protected	An attempt was made to write to a write protected floppy disk.
Recalled setup or data file corrupt	An attempt to recall a setup from internal memory, the GPIB or disk failed due to software revision or hardware mismatch or checksum error.

Table 12-3. GPIB-Related Error Messages (6 of 8)

Error Message	Description
New frequency list not allowed in current state	Cannot set up a new discrete fill definition while performing a calibration or when correction is turned on. Also, cannot do this when group delay is the graph type on the active channel.
State change not permitted	An attempt was made to perform an illegal state change or action based on the current instrument state. This includes attempting to store (1) an undefined band definition, (2) certain changes from the calibration state, or (3) the cal define state when defining discrete frequencies.
Faulty label or file name	The label or file name associated with the current mnemonic is faulty.
Illegal characters in filename	The first character in a filename must be an alpha type. The remaining characters can be alpha, numeric, or underscores. An extension is not permitted.
Filename too long	The maximum ledngth for filenames is 8 characters. An extension is not permitted.
Floppy disk read error Floppy disk write error Hard disk read error Hard disk write error	Read or write error(s) occurred while attempting to access the indicated disk.
Floppy disk not found Hard disk not found General disk buffer error General floppy drive failure Floppy disk init failure General hard disk failure Hard disk control failure Hard disk init failure Unknown disk error	Other error messages which suggest that the indicated drive is in need of service.
7205 GPIB QUERY ERROR DESCRIPTIONS	
No Response data available	Generated if the controller attempts to read response data from the 37XXX and none is available.
No Response data after PM completion	This is the same as the 'no response data available' case above except that a program message was currently being parsed and executed when the controller attempted to read data. Detection of this error was deferred until the parser/execution block was finished with the current program message and it was observed that no response data was generated.
Response after Indefinite Response discarded	This error is generated when the 37XXX's output queue has already received an Arbitrary ASCII response data element and an attempt is made to place another response data element of any kind into the queue. The new response data element is discarded.
Interrupted - Response data discarded	This error is detected when the output queue contains unread response data and the controller sends a new program message. The response data is discarded.

Table 12-3. GPIB-Related Error Messages (7 of 8)

Error Message	Description
Unterminated - Partial PM will be executed	This error is detected when the 37XXX's input queue is currently receiving a program message but has not yet received the end message, and the controller attempts to read response data from the 37XXX. The partial program message in the input queue is executed as if it were properly terminated.
Deadlock - Response data discarded	This error is detected when both of the 37XXX's input and output queues are full and the controller attempts to send another data byte. In order to prevent bus deadlock, the contents of the output queue are discarded.
7205 GPIB DEVICE DEPENDENT ERROR DESCRIPTIONS	
Q_SEND failure in [a procedure name]	An unsuccessful attempt was made to send a message to a task. The procedure name is the place in the software where the error was detected.
Q_RECEIVE failure in [a procedure name]	A failure was detected while waiting for the reception of a message from a task. The procedure name is the place in the software where the error was detected.
Unable to allocate memory in [a procedure name]	An attempt was made to allocate some temporary memory in order to accomplish a task directed in the program message. The procedure name is the place in the software where the error was detected.
Unable to release memory in [a procedure name]	An attempt was made to return some temporary memory within a task and the return failed for some reason. The procedure name is the place in the software where the error was detected.
Unable to get service/error log	An unsuccessful attempt was made to get a copy of the service or error log.
Unable to get calibration term	An unsuccessful attempt was made to get a calibration term.
Unable to get raw or corrected data	An unsuccessful attempt was made to get raw or corrected data.
Unable to get final data	An unsuccessful attempt was made to get final data.
Unable to get setup or data	An unsuccessful attempt was made to get the frequency list from the database.
Unable to get setup	An unsuccessful attempt was made to get a front panel setup.
Unable to store setup	An unsuccessful attempt was made to save a front panel setup.
Unable to get frequency list	An unsuccessful attempt was made to get setup, trace, or tabular datat from the database.
Unable to store label	An unsuccessful attempt was made to store a label in the database.

Table 12-3. *GPIB-Related Error Messages (8 of 8)*

Error Message	Description
Calibration step failure	An error occurred while waiting for completion of a data collection sequence in calibration.

Table 12-4. Service Log Error Messages (1 of 3)

Error Message
0000 – 0099 Status Messages or Pass/Fail Result of a Peripheral or Self Test
0000 INFORMATIONAL MESSAGE
0000 SELF TEST INFO MESSAGE
0094 PRNT INTERFACE TEST PASSED
0095 PRNT INTERFACE TEST FAILED
0096 GPIB INTERFACE TEST PASSED
0097 GPIB INTERFACE TEST FAILED
0098 SELF TEST PASSED
0099 SELF TEST FAILED
0100 – 3999 Primarily Indicate a Self Test Failure
0111 LO1 COMM FAIL
0112 LO1 PRE TUNE DAC FAIL
0113 LO1 PHS LCK IND FAIL
0114 PHS LCK ERR VOL OUT OF TOL
0115 LO1 LCK TIME FAIL
0211 LO2 COMM FAIL
0212 LO2 MAIN PREST DAC FAIL
0213 LO2 OFFS PREST DAC FAIL
0214 MAIN PHS LCK ERR VOL FAIL
0215 OFFST PHS LCK ERR VOL FAIL
0216 DDS PHS LCK ERR VOL FAIL
0217 MAIN PHS LCK IND FAIL
0218 OFFST PHS LCK IND FAIL
0219 DDS PHS LCK IND FAIL
0220 LO2 LCK TIME FAIL
0221 LO2 SRC TRACKING FAIL
0311 TA IF COMM FAIL
0312 TA IF 10V REF FAIL
0313 TA IF LEVEL STATUS FAIL
0314 TA PHS CONTROL FAIL
0411 REF IF COMM FAIL
0412 REF IF 10V REF FAIL
0413 REF IF LEV STATUS FAIL
0414 REF PHS CONTROL FAIL
0500 A TO D CONVERSION FAIL
0511 A TO D COMM FAIL
0512 A TO D 8 BIT D TO A FAIL
0513 A TO D 12 BIT A TO D FAIL
0514 A TO D STEERING DAC FAIL
0515 A TO D CONV ACCURACY FAIL
0516 A TO D SAMPL HOLD FAIL
0517 IF SYNC FAIL
0518 PWR SUPPLY SYNC FAIL
0519 A TO D EXT ANAL OUTP FAIL
0520 PWR SUPPLY +5V FAIL
0521 PWR SUPPLY +9V FAIL
0522 PWR SUPPLY +12V FAIL
0524 PWR SUPPLY +18V FAIL
0525 PWR SUPPLY -18V FAIL
0526 PWR SUPPLY +27V FAIL
0527 PWR SUPPLY -27V FAIL
0611 TB IF COMM FAIL
0612 TB IF 10V REF FAIL
0613 TB IF LEVEL STATUS FAIL
0614 TB PHS CONTROL FAIL
0711 LO3 COMM FAIL
0712 LO3 REF OSC FAIL
0713 LO3 48.4 LCK IND FAIL
0714 LO3 48.4 LCK ERR VOL FAIL
0715 LO3 CAL REF PHS FAIL
0811 SL SIG SEP COMM FAIL
0812 DAC ADJUSTMENT FAIL
0813 TRANSFER SWITCH CNTRL FAIL

Table 12-4. Service Log Error Messages (2 of 3)

Error Message
0814 SRC LCK POL CONTROL FAIL
0815 DIRECT MODE ATTEN FAIL
0911 A9 VME BUS INTERFACE FAIL
0912 BBRAM CHECK FAIL
0913 SRAM CHECK FAIL
0914 SCSI DEVICE FAIL
0915 MCCHIP FAIL
0915 MCCHIP TIMER 1 FAIL
0916 MCCHIP TIMER 2 FAIL
0917 MCCHIP TIMER 3 FAIL
0918 MCCHIP TIMER 4 FAIL
0919 CLOCK NOT RUNNING
1311 A13 VME BUS INTERFACE FAIL
1312 EXT KEYBD CNTRL FAIL
1313 FLOPPY DISK CNTRL FAIL
1411 A14 VME BUS INTERFACE FAIL
1511 A15 VME BUS INTERFACE FAIL
1512 VRAM CHECK FAIL
1611 HARD DISK CONTROL FAIL
1811 AUXILLARY IO FAIL
1912 FRONT PANEL CNTRL FAIL
1913 ROTARY KNOB FAIL
2111 SRC COMM FAIL
2112 SRC FTUNE DAC FAIL
2113 SRC STATE MACHINE DAC FAIL
2114 SRC FM CAL FAIL
2115 SRC F TUNE PATH BND1 FAIL
2116 SRC F TUNE PATH BND2 FAIL
2117 SRC F TUNE PATH BND3 FAIL
2118 SRC F TUNE PATH BND4 FAIL
2119 SRC F TUNE PATH BND5 FAIL
2120 SRC F TUNE PATH BND6 FAIL
2121 SRC F TUNE PATH BND7 FAIL
2122 SRC F TUNE PATH BND8 FAIL
2123 SRC F TUNE PATH BND9 FAIL
2124 SRC F TUNE PATH BND10 FAIL
2125 SRC PWR LEVEL DAC FAIL
2126 SRC DETECTOR ZERO CAL FAIL
2127 SRC ALC CAL BND1 FAIL
2128 SRC ALC CAL BND2 FAIL
2129 SRC ALC CAL BND3 FAIL
2130 SRC ALC CAL BND4 FAIL
2131 SRC ALC CAL BND5 FAIL
2132 SRC ALC CAL BND6 FAIL
2133 SRC ALC CAL BND7 FAIL
2134 SRC ALC CAL BND8 FAIL
2135 SRC ALC CAL BND9 FAIL
2136 SRC ALC CAL BND10 FAIL
2137 SRC A1 FM PATH TUNE FAIL
2138 SRC A2 FM PATH TUNE FAIL
4100 LO1 CAL FAIL
4200 LO2 CAL FAIL
4301 SRC FREQ CAL MEAS UNSTABLE
4302 SRC FREQ FM MAIN CAL FAIL
4303 SRC FREQ FM SENS CAL FAIL
4304 SRC FREQ CAL VERIFY FAIL
4401 SRC ALC LOG AMP CAL FAIL
4402 SRC ALC CAL VERIFY FAIL
4500 IF CAL FAIL
4600 GAIN RANGING ERROR
4700 STATE MACHINE FAIL
5000 – 5999 Indicate Run-Time RF Power Problems
5110 RF PWR UNLEVELED

Table 12-4. Service Log Error Messages (3 of 3)

Error Message
5210 REF A CHAN RF OVERLOAD
5220 REF B CHAN RF OVERLOAD
5230 TA CHAN RF OVERLOAD
5240 TB CHAN RF OVERLOAD
6000 – 6999 Indicate Phase Lock Problems
6001 - 6128 PHASE LOCK FAILURE
7000 – 7999 Indicate Run-Time Digital Section Problems
7100 FILE MARKED READ ONLY
7140 GENERAL FLOPPY DRIVE FAIL
7142 FLOPPY DISK READ ERROR
7143 FLOPPY DISK WRITE ERROR
7146 FLOPPY DISK CHANGED
7147 FLOPPY DISK UNAVAILABLE
7169 FLOPPY INIT FAIL
7170 GENERAL HARD DISK FAIL
7172 HARD DISK READ ERROR
7173 HARD DISK WRITE ERROR
7177 HARD DISK UNAVAILABLE
7199 HARD DISK INIT FAIL
7200 IEEE 488.2 GPIB BUS ERROR
7201 ABORTED MESSAGES
7202 NOTHING TO SAY
7203 NO LISTENER ON BUS
7204 GPIB COMMAND ERROR
7205 GPIB EXECUTION ERROR
7206 GPIB DEVICE SPECIFIC ERROR
7207 GPIB QUERY ERROR
7210 DEDICATED GPIB BUS ERROR
7220 PLOTTER NOT RESPONDING
7221 PLOTTER NOT READY
7222 PLOTTER OUT OF PAPER
7223 PLOTTER PEN UP
7230 POWER METER NOT RESPONDING
7240 FRQ COUNTER NOT RESPONDING
7250 EXT SOURCE NOT RESPONDING
7310 PRINTER NOT RESPONDING
7311 PRINTER NOT READY
7312 PRINTER OUT OF PAPER
7320 AUX I/O PORT ERROR
7330 SERIAL PORT ERROR
7340 ETHERNET PORT ERROR
7350 EXT TRIG RATE TOO FAST
7410 EXT KYBD ERROR
8000 – 8999 Indicate Run-Time Processing System Problems
8100 PWR FAIL
8110 GENERAL VME BUS FAIL
8120 GENERAL MEMORY FAIL
8121 NON-VOLATILE MEMORY FAIL
8130 PROCESSING FAIL
8140 GENERAL DISK BUFFER ERR

Part 4 Supplemental Data

This part consists of four appendices that provide supplemental data that will aid in understanding the 37XXX programming material.

***Appendix A** – contains a primer for the IEEE 488 GPIB. This primer is intended to assist new users in understanding GPIB basics.*

***Appendix B** – provides a quick reference to all 37XXX GPIB commands. Each reference lists the command name, a brief description of the command function, and a reference to the pertinent Chapter in this manual.*

***Appendix C** – provides compatibility information for crossing 37XXX GPIB commands to 360B GPIB commands.*

Appendix A
Introduction to the IEEE 488 Bus

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Appendix A Introduction to the IEEE 488 Bus

A-1 INTRODUCTION

This appendix contains general descriptions of the IEEE 488 Bus, generally known as the General Purpose Interface Bus (GPIB).

A-2 IEEE 488.2 STANDARD

The IEEE 488.2 Standard specifies the use of protocols, formats, and certain common commands for use with the GPIB. The applicable information regarding IEEE 488.2 usage for the 37XXX is documented throughout the 37XXX Programming Manual where used.

A-3 IEEE 488.1 BUS OVERVIEW

The IEEE-488 General Purpose Interface Bus (GPIB) is an instrumentation interface for integrating instruments, computers, printers, plotters, and other measurement devices into systems. The GPIB uses 16 signal lines to effect transfer of information between all devices connected on the bus.

The following requirements and restrictions apply to the GPIB.

- No more than 15 devices can be interconnected by one contiguous bus; however, an instrumentation system may contain more than one interface bus.
- The maximum total cumulative cable length for one interface bus may not exceed twice the number of devices connected (in meters), or 20 meters whichever is less.
- A maximum data rate of 1 Mb/s across the interface on any signal line.
- Each device on the interface bus must have a unique address, ranging from 00 to 30.

The devices on the GPIB are connected in parallel, as shown in Figure A-1. The interface consists of 16 signal lines and 8 ground lines in a shielded cable. Eight of the signal lines are the data lines, DIO 1 thru DIO 8. These data lines carry messages (data and commands), one byte at a time, among the GPIB devices. Three of the remaining lines are the handshake lines that control the transfer of message bytes between devices. The five remaining signal lines are referred to as interface management lines.

The following paragraphs provide an overview of the GPIB including a description of the functional elements, bus structure, bus data transfer

process, interface management bus, device interface function requirements, and message types.

A-4 IEEE 488 BUS FUNCTIONAL ELEMENTS

Effective communications between devices on the GPIB requires three functional elements; a talker, a listener, and a controller. Each device on the GPIB is categorized as one of these elements depending on its current interface function and capabilities.

Talker A talker is a device capable of sending device-dependent data to another device on the bus when addressed to talk. Only one GPIB device at a time can be an active talker.

Listener A listener is a device capable of receiving device-dependent data from another device on the bus when addressed to listen. Any number of GPIB devices can be listeners simultaneously.

Controller A controller is a device, usually a computer, capable of managing the operation of the GPIB. Only one GPIB device at a time can be an active controller. The active controller manages the transfer of device-dependent data between GPIB devices by designating who will talk and who will listen.

System Controller The system controller is the device that always retains ultimate control of the GPIB. When the system is first powered-up, the system controller is the active controller and manages the GPIB. The system controller can pass control to a device, making it the new active controller. The new active controller, in turn, may pass control on to yet another device. Even if it is not the active controller, the system controller maintains control of the Interface Clear (IFC) and Remote Enable (REN) interface management lines and can thus take control of the GPIB at anytime.

A-5 IEEE 488 BUS STRUCTURE

The GPIB uses 16 signal lines to carry data and commands between the devices connected to the bus. The interface signal lines are organized into three functional groups.

- Data Bus (8 lines)
- Data Byte Transfer Control Bus (3 lines)
- General Interface Management Bus (5 lines)

The signal lines in each of the three groups are designated according to function. Table A-1 lists these designations.

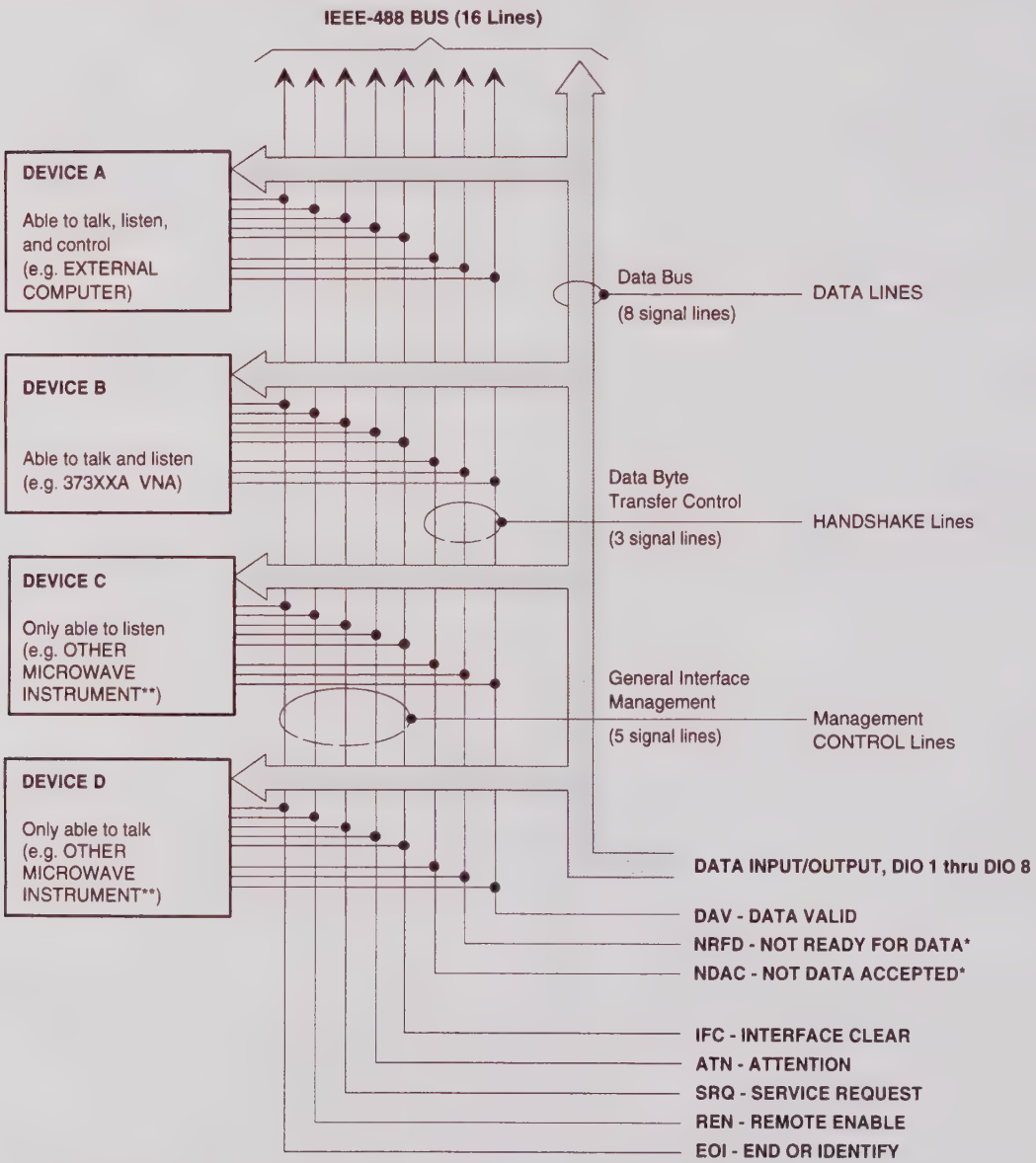
Table A-1. *Interface Bus Signal Line Designations*

Bus Type	Signal Line Name	Function
Data Bus	DIO1–DIO8	Data Input/Output, 1 thru 8
Data Byte Transfer and Control	DAV	Data Available
	NRFD	Not Ready For Data
	NDAC	Not Data Accepted
General Interface Control	ATN	Attention
	IFC	Interface Clear
	SRQ	Service Request
	REN	Remote Enable
	EOI	End Or Identify

A-6 IEEE 488 DATA BUS DESCRIPTION

The data bus is the conduit for the transfer of data and commands between the devices on the GPIB. It contains eight bi-directional, active-low signal lines—DIO 1 thru DIO 8. Data and commands are transferred over the data bus in byte-serial, bit-parallel form. This means that one byte of data (eight bits) is transferred over the bus at a time. DIO 1 represents the least-significant bit (LSB) in this byte and DIO 8 represents the most-significant bit (MSB). Bytes of data are normally formatted in seven-bit ASCII (American Standard Code for Information Interchange) code. The eighth (parity) bit is not used.

Each byte placed on the data bus represents either a command or a data byte. If the Attention (ATN) interface management line is TRUE while the data is transferred, then the data bus is carrying a bus command which is to be received by every GPIB device. If ATN is FALSE, then a data byte is being transferred and only the active listeners will receive that byte.


IEEE-488 BUS (16 Lines)
DEVICE A
Able to talk, listen, and control (e.g. EXTERNAL COMPUTER)
DEVICE B
Able to talk and listen (e.g. 373XXA VNA)
DEVICE C
Only able to listen (e.g. OTHER MICROWAVE INSTRUMENT**)
DEVICE D
Only able to talk (e.g. OTHER MICROWAVE INSTRUMENT**)
Data Bus
(8 signal lines)
DATA LINES
Data Byte Transfer Control
(3 signal lines)
HANDSHAKE Lines
General Interface Management
(5 signal lines)
Management CONTROL Lines
DATA INPUT/OUTPUT, DIO 1 thru DIO 8
DAV - DATA VALID
NRFD - NOT READY FOR DATA*
NDAC - NOT DATA ACCEPTED*
IFC - INTERFACE CLEAR
ATN - ATTENTION
SRQ - SERVICE REQUEST
REN - REMOTE ENABLE
EOI - END OR IDENTIFY

* Negation is represented by low state on these two lines

** The configuration shown in this diagram depicts an external computer connected via GPIB to a 373XXA Vector Network Analyzer and other microwave instruments (if used).

Figure A-1. *Interface Connections and Bus Structure*

A-7 DATA BYTE TRANSFER CONTROL BUS DESCRIPTION

Control of the transfer of each byte of data on the data bus is accomplished by a technique called the three-wire handshake, which involves the three signal lines of the Data Byte Transfer Control Bus. This technique forces data transfers at the speed of the slowest listener, which ensures data integrity in multiple listener transfers. One line (DAV) is controlled by the talker, while the other two (NRFD and NDAC) are wired-OR lines shared by all active listeners. The handshake lines, like the other GPIB lines, are active low. The technique is described briefly in the following paragraphs and is depicted in Figure A-2. For further information, refer to ANSI/IEEE Std 488.1.

DAV *Data Valid*
This line is controlled by the active talker. Before sending any data,

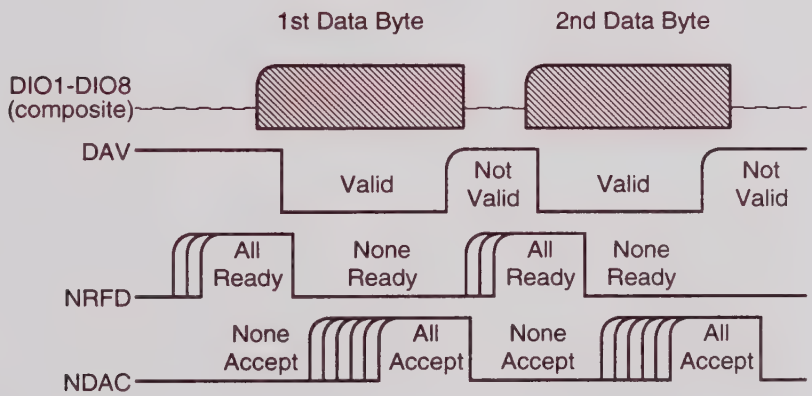


Figure A-2. *Typical GPIB Handshake Operation*

the talker verifies that NDAC is TRUE (active low) which indicates that all listeners have accepted the previous data byte. The talker then places a byte on the data lines and waits until NRFD is FALSE (high), which indicates that all addressed listeners are ready to accept the information. When both NRFD and NDAC are in the proper state, the talker sets the DAV line TRUE (active low) to indicate that the data on the bus is valid (stable).

NRFD *Not Ready For Data*

This line is used by the listeners to inform the talker when they are ready to accept new data. The talker must wait for each listener to set the NRFD line FALSE (high), which they will do at their own rate. This assures that all devices that are to accept the data are ready to receive it.

NDAC *Not Data Accepted*

This line is also controlled by the listeners and is used to inform the talker that each device addressed to listen has accepted the data. Each device releases NDAC at its own rate, but NDAC will not go FALSE (high) until the slowest listener has accepted the data byte.

A-8 GENERAL INTERFACE MANAGEMENT BUS DESCRIPTION

The general interface management bus is a group of five signal lines used to manage the flow of information across the GPIB. A description of the function of each of the individual control lines is provided below.

ATN *Attention*
The active controller uses the ATN line to define whether the information on the data bus is a command or is data. When ATN is TRUE (low), the bus is in the command mode and the data lines carry bus commands. When ATN is FALSE (high), the bus is in the data mode and the data lines carry device-dependent instructions or data.

EOI *End or Identify*
The EOI line is used to indicate the last byte of a multibyte data transfer. The talker sets the EOI line TRUE during the last data byte.

The active controller also uses the EOI line in conjunction with the ATN line to initiate a parallel poll sequence.

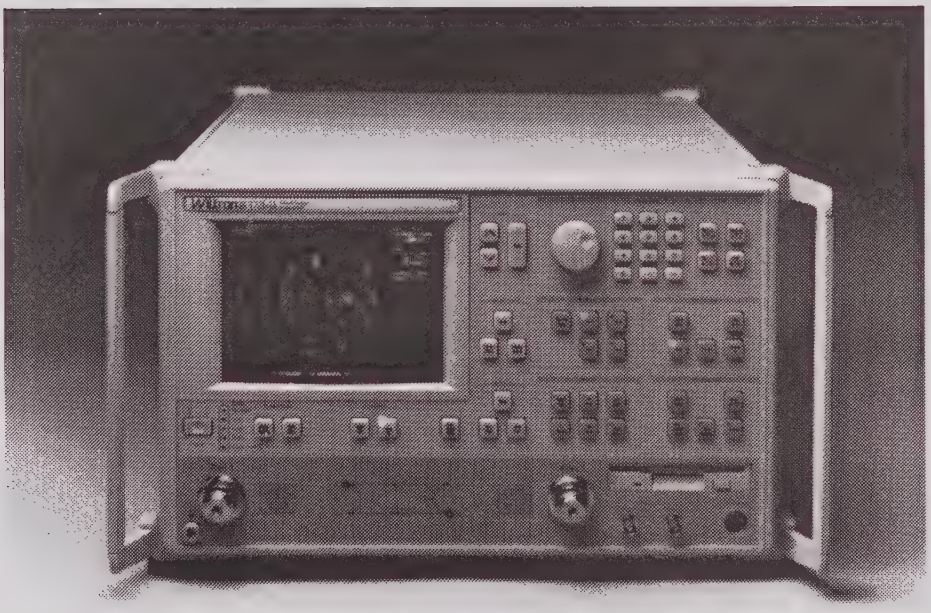
IFC *Interface Clear*
Only the system controller uses this line. When IFC is TRUE (low), all devices on the bus are placed in a known, quiescent state (unaddressed to talk, unaddressed to listen, and service request idle).

REN *Remote Enable*
Only the system controller uses this line. When REN is set TRUE (low), the bus is in the remote mode and devices are addressed either to listen or to talk. When the bus is in remote and a device is addressed, it receives instructions from the GPIB rather than from its front panel. When REN is set FALSE (high), the bus and all devices return to local operation.

SRQ *Service Request*
The SRQ line is set TRUE (low) by any device requesting service by the active controller.

37XXX Series Vector Network Analyzer

GPIB QUICK REFERENCE GUIDE



This manual supplements the 37XXX Series Vector Network Analyzer Programming Manual. Insert it behind the tab marked Appendix B, GPIB Quick Reference Guide in that manual.

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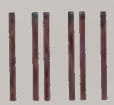

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37XXX VNA GPIB Quick Reference Guide

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37XXX VNA GPIB Quick Reference Guide

1. INTRODUCTION

This appendix provides a quick reference to the 37XXX GPIB Programming commands.

2. GENERAL

This guide is divided into two listings. Table 1 (beginning on page 5) provides an alphabetical listing of all 37XXX commands. These commands are also listed alphabetically and fully described in the 37XXX Programming Manual, Chapter 10.

Table 2 (beginning on page 23) provides a command listing that is functionally grouped. These function groups are described in Chapters 4 thru 9 of the 37XXX Programming Manual.

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
*CLSF	Clear status bytes and structures
*DDT	Enter the 488.2 Define Device Trigger command string
*DDT?	Output the 488.2 Define Device Trigger command string
*ESE	Enter the 488.2 Standard Event Status Enable mask
*ESE?	Output the 488.2 Standard Event Status Enable mask
*ESR?	Output the 488.2 Standard Event Status Register value
*IDN?	Output the 488.2 instrument identification string
*IST?	Output the value of the ist message
*OPC	Initiate the 488.2 Operation Complete sequence
*OPC?	Initiate the 488.2 Operation Complete Query sequence
*OPT?	Output the 488.2 options installed string
*PRE	Enter the 488.2 Parallel Poll Register Enable mask
*PRE?	Output the 488.2 Parallel Poll Register Enable mask
*RST	Instrument reset
*SRE	Enter the 488.2 Service Request Enable mask
*SRE?	Output the 488.2 Service Request Enable mask
*STB?	Output the 488.2 Status Byte value
*TRG	Initiate a Group Execute Trigger sequence
*TST?	Perform self test and output status
*WAI	Wait to continue
A12	Simulate 12-term calibration
A8R	Simulate 1-path 2-port calibration reverse path
A8T	Simulate 1-path 2-port calibration forward path
ABT	Simulate trans freq response calibration forward and reverse
ADD	Select addition as trace math for active channel
ADDFC	Enter frequency counter GPIB address
ADDFC?	Output frequency counter GPIB address
ADDPLT	Enter plotter GPIB address
ADDPLT?	Output plotter GPIB address
ADDPM	Enter power meter GPIB address
ADDPM?	Output power meter GPIB address
ADPL	Enter electrical length for adapter removal
ADPL?	Output electrical length for adapter removal
ADRIVE	Select the floppy drive as the default drive
AFT	Simulate transmission frequency response calibration forward path
AH0	Turn automatic DUT protection off
AH1	Turn automatic DUT protection on
AHX?	Output automatic DUT protection on/off status
ALC	Perform ALC loop internal calibration
AMKR	Select active marker on all channels marker mode
ANNCOL	Enter the color number for annotation and menu text
ANNCOL?	Output the color number for annotation and menu text
AOF	Turn averaging off
AOF?	Output averaging on/off status
AON	Turn averaging on
APR	Enter group delay aperture setting on active channel
APR?	Output group delay aperture setting on active channel
ARB	Simulate reflection only calibration both ports
ARF	Simulate reflection only calibration port 1
ARR	Simulate reflection only calibration port 2
ART	Simulate trans freq response calibration reverse path
ASC	Autoscale the active channel display
ASP	Enter polar stop sweep position angle
ASP?	Output polar stop sweep position angle
AST	Enter polar start sweep position angle
AST?	Output polar start sweep position angle
ATTN	Attach next segment and make the active segment
AVG	Enter averaging count and turn on
AVG?	Output averaging count
BBL	Select broadband load for calibration
BBZ	Enter broadband load impedance for calibration

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
BBZL	Enter broadband load inductance for calibration
BC0	Turn CRT display off (disabled)
BC1	Turn CRT display on (disabled)
BCKCOL	Enter the color number for background
BCKCOL?	Output the color number for background
BCX?	Output CRT display on/off status
BD1	Select band 1 for definition
BD2	Select band 2 for definition
BD3	Select band 3 for definition
BD4	Select band 4 for definition
BD5	Select band 5 for definition
BDMM	Define Millimeter Wave band equations
BEEP0	Disable the instrument beeper on GPIB errors
BEEP1	Enable the instrument beeper on GPIB errors
BEEPX?	Output GPIB beep on error enable/disable status
BEG	Begin taking calibration data
BEGN	Begin next segment and make it the active segment
BH0	Turn bias off while in hold
BH1	Turn bias on while in hold
BHX?	Output bias on/off during hold status
BMPB	Select Black on White as bitmap type
BMPC	Select Color on White as bitmap type
BMPT	Select true color as bitmap type
BPF	Enter break point frequency for 3 line LRL calibration
BSP	Enter band stop frequency
BSP?	Output band stop frequency
BST	Enter band start frequency
BST?	Output band start frequency
BWL3	Set bandwidth loss value to 3 dB
BWLS	Enter bandwidth loss value
BWLS?	Output bandwidth loss value
C12	Select 12 term calibration
C8R	Select 1-path 2-port calibration reverse path
C8T	Select 1-path 2-port calibration forward path
CALR	Perform receiver cal for gain compression testing
CAS	Clear active segmented limit vertical/horizontal definitions
CBT	Select trans freq response calibration forward and reverse
CC0	Enter capacitance coefficient 0 for open
CC1	Enter capacitance coefficient 1 for open
CC2	Enter capacitance coefficient 2 for open
CC3	Enter capacitance coefficient 3 for open
CCD	Collect corrected data in an internal buffer
CD	Change default directory
CDRIVE	Select the hard disk as the default drive
CF2	Select female 2.4mm connector for current port
CF3	Select female GPC-3.5 connector for current port
CFC	Select female TNC connector for current port
CFD	Collect final data in an internal buffer
CFK	Select female K connector for current port
CFN	Select female Type N connector for current port
CFN75	Select Female type N 75-ohm connector for current port
CFS	Select female SMA connector for current port
CFSP	Select Special Female connector for current port
CFT	Select trans freq response calibration forward path
CFV	Select female V connector for current port
CH1	Make channel 1 the active channel
CH2	Make channel 2 the active channel
CH3	Make channel 3 the active channel
CH4	Make channel 4 the active channel
CHX?	Output active channel number
CL0	Enter inductive coefficient 0 for short
CL1	Enter inductive coefficient 1 for short
CL2	Enter inductive coefficient 2 for short
CL3	Enter inductive coefficient 3 for short
CLB	Clear all multiple source band definitions
CLBMM	Clear the new Millimeter Wave band definitions
CM	Suffix sets distance data type and scales by 1E-2

Table 1. Alphabetical Listing of Programming Codes (Mnemonics)

Command	Description
CM2	Select male 2.4mm connector for current port
CM3	Select male GPC-3.5 connector for current port
CMC	Select male TNC connector for current port
CMK	Select male K connector for current port
CMN	Select male N connector for current port
CMN75	Select Male type N 75-Ohm connector for current port
CMS	Select male SMA connector for current port
CMSP	Select Special Male connector for current port
CMT	Suffix sets distance data type and scales by 1E-2
CMV	Select male V connector for current port
CMX?	Output calibration method
CND	Select user specified connector for current port
CNG	Select GPC-7 connector for current port
CNTR	Enter center frequency
CNTR?	Output center frequency
COF	Turn error correction off
CON	Turn error correction on
CON?	Output error correction on/off status
COO	Enter offset for open for user specified connector
COPY	Copy a files contents to another file
COS	Enter offset for short for user specified connector
CRB	Select reflection only calibration both ports
CRD	Collect raw data in an internal buffer
CRF	Select reflection only calibration port 1
CRR	Select reflection only calibration port 2
CRT	Select trans freq response calibration reverse path
CSB	Clear status bytes and structures (same as *CLS)
CSF?	Output cal start frequency
CSL	Clear service log
CTF?	Output cal stop frequency
CTN	Continue sweeping from current point
CWC	Select CW frequency calibration data points
CWD?	Output current working directory string
CWF	Enter CW frequency and turn CW on
CWF?	Output CW frequency
CWON	Turn CW on at current CW frequency
CWON?	Output CW on/off status
CWP	Enter number of points drawn in CW
CWP?	Output number of points drawn in CW
CXD?	Output internal buffer data collection mode
CXX?	Output calibration type
D13	Display channels 1 & 3
D14	Display all four channels
D24	Select dual channel display with channels 2 & 4
DA1	Select a1 = Ra as denominator for parameter being defined
DA2	Select a2 = Rb as denominator for parameter being defined
DAT	Display data only on active channel
DAT?	Output trace memory display mode
DATCOL	Enter the color number for data
DATCOL?	Output the color number for data
DATE	Enter the system date
DATE?	Output the system date
DB	Suffix sets power data type
DB1	Select b1 = Ta as denominator for parameter being defined
DB2	Select b2 = Tb as denominator for parameter being defined
DBL	Suffix sets power data type
DBM	Suffix sets power data type
DBP	Select distance bandpass mode for active channel
DC1	Display channel 1 and 2 operating parameters
DC3	Display channel 3 and 4 operating parameters
DCA	Select automatic DC term calculation for lowpass
DCCTN	Resume internal buffer data collection
DCCTN?	Output internal buffer data collection resume/suspend status
DCHLD	Suspend internal buffer data collection

Table 1. Alphabetical Listing of Programming Codes (Mnemonics)

Command	Description
DCMRK	Inserts the mark value into the internal buffer
DCO	Select open for DC term for lowpass
DCOFF	Turn internal buffer data collection mode off
DCP	Display calibration parameters 1st page
DCP1	Display calibration parameters 1st page
DCP2	Display calibration parameters 2nd page
DCS	Select short for DC term for lowpass
DCV	Enter value for DC term for lowpass
DCV?	Output lowpass DC term value
DCX?	Output lowpass DC term selection
DCZ	Select line impedance for DC term for lowpass
DD0	Turn data drawing off
DD1	Turn data drawing on
DD1?	Output data drawing on/off status
DDX?	Output active channel domain parameter frequency distance or time
DE1	Select unity as denominator for parameter being defined
DEG	Suffix sets phase data type
DEL	Delete a file from disk
DEN?	Output denominator selection for parameter being defined
DF2	Display 2.4mm female connector information
DF3	Display GPC-3.5 female connector information
DFC	Select discrete frequency calibration data points
DFD	Done specifying discrete frequency ranges
DFK	Display K female connector information
DFN	Display N female connector information
DFN75	Display N Female 75-Ohm connector information
DFP	Display Front panel instrument state
DFQ	Enter single discrete frequency
DFS	Display SMA female connector information
DFSP	Display Special Female connector information
DFT	Display TNC female connector information
DFV	Display V female connector information
DG7	Display GPC-7 Male connector information
DGS	Display GPIB status information
DGT	Display 1st CRT test pattern
DGT1	Display 1st CRT test pattern
DGT2	Display 2nd CRT test pattern
DGT3	Display 3rd CRT test pattern
DIA	Select air as active dielectric
DIE	Enter a dielectric value
DIM	Select microporous teflon as active dielectric
DIP	Select polyethylene as active dielectric
DIR	Output a directory listing to the GPIB
DIS	Display active segmented limit
DIS?	Output active segmented limit on/off status
DISKRD	Output disk file data to the GPIB
DISKWR	Write GPIB data to a disk file
DIT	Select Teflon as active dielectric
DIV	Select division as trace math for active channel
DIX?	Output dielectric constant
DLA	Select group delay display for active channel
DLP	Select distance lowpass mode for active channel
DM2	Display 2.4mm male connector information
DM3	Display GPC-3.5 male connector information
DMK	Display K male connector information
DMN	Display N male connector information
DMN75	Display N Male 75-Ohm connector information
DMS	Display SMA male connector information
DMSP	Display Special Male connector information
DMT	Display TNC male connector information
DMV	Display V male connector information
DNM	Display data normalized to trace memory on active channel
DPI	Select distance phasor impulse mode for active channel
DPN	Enter pen number for data
DPR0	Visible data only OFD format
DPR1	Data pair always OFD format
DPRX?	Output data pair mode visible only or pair always
DR1	Select Marker 1 as Delta Reference Marker

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
DR2	Select Marker 2 as Delta Reference Marker
DR3	Select Marker 3 as Delta Reference Marker
DR4	Select Marker 4 as Delta Reference Marker
DR5	Select Marker 5 as Delta Reference Marker
DR6	Select Marker 6 as Delta Reference Marker
DRF	Turn delta reference mode on
DRL	Diagnostic read latch
DRO	Turn delta reference mode off
DRO?	Output delta reference mode on/off status
DRX?	Output delta reference marker number
DSF0	Disable filter shape factor calculation
DSF1	Enable filter shape factor calculation
DSFX?	Output filter shape factor calculation enable/disable status
DSP	Select single channel display
DSP?	Output channel display mode
DSQ0	Disable filter Q calculation
DSQ1	Enable filter Q calculation
DSQX?	Output filter Q calculation enable/disable status
DTM	Display measurement data and trace memory on active channel
DVM	Enter DVM channel number
DWG	Display waveguide parameters
DWL	Diagnostic write latch
E12	Set Millimeter Wave band to E band (WR-12)
E12E	Set Millimeter Wave band to E band (WR-12)
ECW	Select CW operation for component being edited
ED1	Edit source 1 equation
ED2	Edit source 2 equation
EDG	End diagnostics mode
EDR	Edit receiver equation
EDV	Enter divisor value for equation being edited
EDV?	Output divisor value for equation being edited
EKT	Select external keyboard testing
EML	Enter multiplier value for equation being edited
EML?	Output multiplier value for equation being edited

Command	Description
EOS	Enter offset frequency for equation being edited
EOS?	Output offset frequency for equation being edited
ESW	Select sweep operation for component being edited
EXD	Display external A/D input
EXISTD?	Output directory existence information
EXISTF?	Output file existence information
EXW?	Output multiple source sweep flag for equation being edited
FCW0	Turn fast CW measurement mode off
FCW1	Turn fast CW measurement mode on
FCW2	Turn Fast CW mode 2 on
FCWX?	Output fast CW measurement mode on/off status
FDH0	Select variable length arbitrary block headers
FDH1	Select fixed length arbitrary block headers
FDH2	Select zero length arbitrary block headers
FDHX?	Output arbitrary block header length selection
FFD	Send form feed to printer and stop print/plot
FGT	Select frequency with time gate for active channel
FHI	Set data points to 1601
FIL	Fill defined discrete frequency range
FLC	Source frequency linearity internal calibration
FLO	Set data points to 101
FLTBW?	Output filter bandwidth
FLTC?	Output filter center frequency
FLTL?	Output filter loss at reference value
FLTQ?	Output filter Q
FLTS?	Output filter shape factor
FMA	Select ASCII data transfer format
FMB	Select IEEE754 64 bit data transfer format
FMC	Select IEEE754 32 bit data transfer format
FME	Set data points to 401
FMKR	Select filter parameters marker mode
FMT0	Select normal ascii data element delimiting
FMT1	Select enhanced ascii data element delimiting
FMTX?	Output ascii data element delimiting mode
FMX?	Output data output mode FMA FMB or FMC

Table 1. Alphabetical Listing of Programming Codes (Mnemonics)

Command	Description
FOF	Blank frequency information
FON	Display frequency information
FOX?	Output frequency information on/off status
FP0	Turn flat power correction off
FP1	Turn flat power correction on
FPT	Select front panel keypad testing
FPX?	Output flat power correction on/off status
FQD	Select frequency domain for active channel
FRC	Clear all defined discrete frequency ranges
FRI	Enter Discrete Fill increment frequency
FRP	Enter Discrete Fill number of points
FRS	Enter Discrete Fill start frequency
GCMP	Enter gain compression point search value
GCMP?	Output gain compression point search value
GCT	Enter gate center value distance or time
GCT?	Output gate center value
GDS	Gate symbols displayed on active channel
GHZ	Suffix sets frequency data type and scales by 1E9
GLS	Select low sidelobe gate shape
GMS	Select minimum sidelobe gate shape
GNM	Select nominal gate shape
GOF	Turn off gating on active channel
GOF?	Output gating mode on active channel
GON	Turn on gating on active channel
GPN	Enter pen number for graticule
GRF?	Output graph type for active channel
GRT	Select Rectangular gate shape
GRTCOL	Enter the color number for the graticule
GRTCOL?	Output the color number for the graticule
GSN	Enter gate span value distance or time
GSN?	Output gate span value
GSP	Enter gate stop value distance or time
GSP?	Output gate stop value
GST	Enter gate start value distance or time
GST?	Output gate start value
GSX?	Output gate shape
HC0	Disable internal IF calibration
HC1	Enable internal IF calibration and trigger an IF calibration
HCT	Trigger an IF calibration
HCX?	Output internal IF calibration enable/disable status
HD0	Turn off tabular data headers and page formatting
HD1	Turn on tabular data headers and page formatting
HID	Hide active segmented limit
HLD	Put sweep into hold mode
HLD?	Output the sweep hold status
HPN	Enter pen number for header
HZ	Suffix sets frequency data type
IARF	Enter adapter removal files from GPIB and calibrate
IC1	Enter calibration coefficient 1
IC10	Enter calibration coefficient 10
IC11	Enter calibration coefficient 11
IC12	Enter calibration coefficient 12
IC2	Input Calibration Coefficient 2
IC3	Enter calibration coefficient 3
IC4	Enter calibration coefficient 4
IC5	Enter calibration coefficient 5
IC6	Enter calibration coefficient 6
IC7	Enter calibration coefficient 7
IC8	Enter calibration coefficient 8
IC9	Enter calibration coefficient 9
ICA	Enter calibration coefficient 10
ICB	Enter calibration coefficient 11
ICC	Enter calibration coefficient 12
ICD	Enter corrected data for active channel parameter
ICF	Enter front panel setup and calibration data
ICL	Enter all applicable calibration coefficients for cal type
IEM	Enter extended status byte mask

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
IF1	Select 10 Hz IF bandwidth
IF2	Select 100 Hz IF bandwidth
IF3	Select 1 KHz IF bandwidth
IF4	Select 10 KHz IF bandwidth
IFA	Select 30 KHz IF bandwidth
IFB	Select 1st IF bandpass testing
IFD	Enter final data for active channel parameter
IFM	Select 10 Hz IF bandwidth
IFN	Select 1 KHz IF bandwidth
IFP	Enter current front panel setup
IFR	Select 100 Hz IF bandwidth
IFV	Enter frequency values
IFX?	Output IF bandwidth
IHDW	Enter hardware cal data from GPIB
IKIT	Enter calkit data from GPIB
ILM	Enter limits status byte mask
IMG	Select imaginary display for active channel
IMU	Suffix sets imaginary data type
INRM	Enter normalization data from GPIB
INT	Initialize (format) floppy disk
IPM	Enter the 488.2 Service Request Enable mask
IS1	Enter front panel setup 1
IS10	Enter front panel setup 10
IS2	Enter front panel setup 2
IS3	Enter front panel setup 3
IS4	Enter front panel setup 4
IS5	Enter front panel setup 5
IS6	Enter front panel setup 6
IS7	Enter front panel setup 7
IS8	Enter front panel setup 8
IS9	Enter front panel setup 9
ISC	Enter scale and select inverted compressed Smith Chart display
ISE	Enter scale and select inverted expanded Smith Chart display
ISF	Exclude isolation
ISM	Select normal inverted Smith Chart for active channel
ISN	Include isolation
KEC	Keep existing calibration data
KHZ	Suffix sets frequency data type and scales by 1E3
L1C	Perform LO1 internal calibration
L2C	Perform LO2 internal calibration
LA1	Select a1 = Ra as phase lock for parameter being defined
LA2	Select a2 = Rb as phase lock for parameter being defined
LAND	Select landscape mode for output plot
LAX?	Output phase lock selection for parameter being defined
LAYCOL	Enter the color number for overlay data
LAYCOL?	Output the color number for overlay data
LB0	Turn limits testing beep on failure off
LB1	Turn limits testing beep on failure on
LBX?	Output limits testing beeper enable status
LCM	Select LRL calibration method
LDARF	Load adapter removal files from disk and calibrate
LDT0	Disable printing date/time
LDT1	Enable printing date/time
LFD	Enter limit frequency readout delta value
LFD2	Enter limit frequency readout delta value for bottom graph
LFD2?	Output limit frequency readout delta value for bottom graph
LFD?	Output limit frequency readout delta value
LFP	Select limit frequency readout for phase displays
LFR	Select limit frequency readout for active channel
LID	Enter string for DUT identity
LID?	Output string for DUT identity
LIN	Select linear magnitude display for active channel
LKS0	Disable lock search mode
LKS1	Enable lock search mode
LKT	Load calibration kit information from floppy disk

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
LL1	Enter length of line 1 for LRL calibration
LL2	Enter length of line 2 for LRL calibration
LL3	Enter length of line 3 for LRL calibration
LLM?	Output limit line display mode single or segmented
LLO	Enter lower limit value for top graph on active channel
LLO2	Enter lower limit value for bottom graph on active channel
LLO2?	Output lower limit value for bottom graph on active channel
LLO?	Output lower limit value for top graph on active channel
LLZ	Enter line impedance for LRL calibration
LM2	Select a match for the second device during a LRM type calibration
LM3	Select a match for the third device during a LRM type calibration
LMS	Enter string for DUT model/serial number
LMS?	Output string for DUT model/serial number
LNM	Enter string for operator name
LNM?	Output string for operator name
LO11	Select LO1 phase lock voltage testing
LO12	Select LO1 D/A voltage testing
LO21	Select LO2 main phase lock voltage testing
LO22	Select LO2 offset phase lock voltage testing
LO23	Select LO2 DDS phase lock voltage testing
LO24	Select LO2 main D/A voltage testing
LO25	Select LO2 offset D/A voltage testing
LOC	Enter string for operator comment
LOC?	Output string for operator comment
LOF	Limits display off
LOGO0	Turn hard copy logo off
LOGO1	Turn hard copy logo on
LOGO?	Output hard copy logo selection standard/user defined
LOGOS	Select standard hard copy logo
LOGOU	Select user defined hard copy logo
LOGOX?	Output hard copy logo on/off status
LOL0	Turn lower limit off
LOL1	Turn lower limit on at current value
LOL20	Turn lower limit off for bottom graph
LOL21	Turn lower limit on at current value for bottom graph
LOL2X?	Output lower limit on/off status for bottom graph
LOLX?	Output lower limit on/off status
LON	Limits display on
LON?	Output limits display on/off status
LPF1?	Output limit test failure status on channel 1
LPF2?	Output limit test failure status on channel 2
LPF3?	Output limit test failure status on channel 3
LPF4?	Output limit test failure status on channel 4
LPF?	Output limit test failure status all channels
LPH	Select linear magnitude and phase display for active channel
LPI	Select lowpass impulse response for active channel
LPS	Select lowpass step response for active channel
LPSX?	Output lowpass response for active channel impulse or step
LR2	Specify 2 line LRL calibration
LR3	Specify 3 line LRL calibration
LS1	Set lower segmented limit 100 as the active segment
LS10	Select lower segmented limit 10 as the active segment
LS2	Select lower segmented limit 2 as the active segment
LS3	Select lower segmented limit 3 as the active segment
LS4	Select lower segmented limit 4 as the active segment
LS5	Select lower segmented limit 5 as the active segment
LS6	Select lower segmented limit 6 as the active segment
LS7	Select lower segmented limit 7 as the active segment
LS8	Select lower segmented limit 8 as the active segment

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
LS9	Select lower segmented limit 9 as the active segment
LSB	Select least significant byte first binary transfer
LSEG	Select segmented limit line display mode
LSNG	Select single limit line display mode
LSX?	Output active segmented limit
LT0	Turn limits testing off
LT1	Turn limits testing on
LT1?	Output limits testing enable status
LTC	Select coaxial transmission line for calibration
LTST	Display the limits testing menu
LTU	Select microstrip transmission line for calibration
LTW	Select waveguide transmission line for calibration
LTX?	Output line type
LUP	Enter upper limit value for top graph on active channel
LUP2	Enter upper limit value for bottom graph on active channel
LUP2?	Output upper limit value for bottom graph on active channel
LUP?	Output upper limit value for top graph on active channel
LVH	Select high as limits testing TTL level
LVL	Select low as limits testing TTL level
LVX?	Output limits testing ttl level status
M	Suffix sets distance data type
M1C	Set CW mode at marker 1 frequency
M1E	Set sweep/zoom end to marker 1 frequency distance or time
M1S	Set sweep/zoom start to marker 1 frequency distance or time
M2C	Set CW mode at marker 2 frequency
M2E	Set sweep/zoom end to marker 2 frequency distance or time
M2S	Set sweep/zoom start to marker 2 frequency distance or time
M3C	Set CW mode at marker 3 frequency
M3E	Set sweep/zoom end to marker 3 frequency distance or time
M3S	Set sweep/zoom start to marker 3 frequency distance or time
M4C	Set CW mode at marker 4 frequency
M4E	Set sweep/zoom end to marker 4 frequency distance or time
M4S	Set sweep/zoom start to marker 4 frequency distance or time
M5C	Set CW mode at marker 5 frequency
M5E	Set sweep/zoom end to marker 5 frequency distance or time
M5S	Set sweep/zoom start to marker 5 frequency distance or time
M6C	Set CW mode at marker 6 frequency
M6E	Set sweep/zoom end to marker 6 frequency distance or time
M6S	Set sweep/zoom start to marker 6 frequency distance or time
MAG	Select log magnitude display for active channel
MAT	Select matched reflective devices during cal
MD	Create a new disk directory
MEM	Display trace memory on active channel
MFGCT	Start multiple frequency swept power gain compression test
MHZ	Suffix sets frequency data type and scales by 1E6
MIN	Select subtraction as trace math for active channel
MIX	Select mixed reflective devices during calibration
MK1	Enter marker 1 frequency distance or time and turn on
MK1?	Output marker 1 frequency distance or time
MK2	Enter marker 2 frequency distance or time and turn on
MK2?	Output marker 2 frequency distance or time
MK3	Enter marker 3 frequency distance or time and turn on
MK3?	Output marker 3 frequency distance or time
MK4	Enter marker 4 frequency distance or time and turn on
MK4?	Output marker 4 frequency distance or time
MK5	Enter marker 5 frequency distance or time and turn on

Table 1. Alphabetical Listing of Programming Codes (Mnemonics)

Command	Description
MK5?	Output marker 5 frequency distance or time
MK6	Enter marker 6 frequency distance or time and turn on
MK6?	Output marker 6 frequency distance or time
MKRC	Select interpolated marker functionality
MKRCOL	Enter the color number for the markers
MKRCOL?	Output the color number for the markers
MKRD	Select discrete marker functionality
MKRX?	Output interpolated/discrete marker functionality
MKSL	Marker search left
MKSR	Marker search right
MKT0	Turn marker tracking off
MKT1	Turn marker tracking on
MKTX?	Output marker tracking on/off status
MM	Suffix sets distance data type and scales by 1E-3
MMBX?	Output Millimeter Wave band selection
MMN	Move active marker to minimum trace value
MMT	Suffix sets distance data type and scales by 1E-3
MMX	Move active marker to maximum trace value
MNUCOL	Enter the color number for the menu headers
MNUCOL?	Output the color number for the menu headers
MO1	Turn off marker 1
MO2	Turn off marker 2
MO3	Turn off marker 3
MO4	Turn off marker 4
MO5	Turn off marker 5
MO6	Turn off marker 6
MOF	Turn marker display off
MON	Turn marker display on
MON?	Output marker display on/off status
MPH	Select log magnitude and phase display for active channel
MPN	Enter pen number for markers and limits
MR1	Turn marker 1 on and make it the active marker
MR1?	Output marker 1 on/off status
MR2	Turn marker 2 on and make it the active marker
MR2?	Output marker 2 on/off status
MR3	Turn marker 3 on and make it the active marker
MR3?	Output marker 3 on/off status
MR4	Turn marker 4 on and make it the active marker
MR4?	Output marker 4 on/off status
MR5	Turn marker 5 on and make it the active marker
MR5?	Output marker 5 on/off status
MR6	Turn marker 6 on and make it the active marker
MR6?	Output marker 6 on/off status
MRM	Display the Marker Readout menu
MRR	Restore original marker range
MRX?	Output active marker number
MS	Suffix sets time data type and scales by 1E-3
MS0	Turn multiple source mode off
MS1	Turn multiple source mode on
MSB	Select most significant byte first binary transfer
MSD	Select multiple source define mode
MSFH	Enter high loss value for shape factor calculation
MSFH?	Output high loss value for shape factor calculation
MSFL	Enter low loss value for shape factor calculation
MSFL?	Output low loss value for shape factor calculation
MSR0	Select 0 as reference for marker search and bandwidth calculation
MSRD	Select delta reference marker as reference for marker search and bandwidth calculation
MSRM	Select maximum as reference for marker search and bandwidth calculation
MSRX?	Output reference selection for marker search and bandwidth calculation
MSX?	Output multiple source mode on/off/define
MTH?	Output trace math math type
MTR	Suffix sets distance data type
MUL	Select multiplication as trace math for active channel
MV	Suffix sets voltage data type and scales by 1E-3
NA1	Select a1 as numerator for parameter being defined

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
NA2	Select a2 as numerator for parameter being defined
NB1	Select b1 as numerator for parameter being defined
NB2	Select b2 as numerator for parameter being defined
NCS	Go to next calibration step
NMKR	Select normal markers on active channel marker mode
NOC	Select normal calibration data points
NOFST	Enter nominal offset value for external gain
NOFST?	Output nominal offset value for external gain
NP101	Set data points to 101
NP1601	Set data points to 1601
NP201	Set data points to 201
NP401	Set data points to 401
NP51	Set data points to 51
NP801	Set data points to 801
NRD	Display non-ratioed parameters on 4 channels
NRMS	Normalize S21 for gain compression testing
NS	Suffix sets time data type and scales by 1E-9
NSC	Suffix sets time data type and scales by 1E-9
NU1	Select unity as numerator for parameter being defined
NUM?	Output numerator selection for parameter being defined
OAM1	Output channel 1 active marker value
OAM2	Output channel 2 active marker value
OAM3	Output channel 3 active marker value
OAM4	Output channel 4 active marker value
OBMP	Output the display as a bitmap
OC1	Output calibration coefficients 1
OC10	Output calibration coefficients 10
OC11	Output calibration coefficients 11
OC12	Output calibration coefficients 12
OC2	Output calibration coefficients 2
OC3	Output calibration coefficients 3
OC4	Output calibration coefficients 4
OC5	Output calibration coefficients 5
OC6	Output calibration coefficients 6
OC7	Output calibration coefficients 7
OC8	Output calibration coefficients 8
OC9	Output calibration coefficients 9
OCA	Output calibration coefficient A
OCB	Output calibration coefficient B
OCC	Output calibration coefficient C
OCD	Output corrected data for active channel parameter
OCF	Output front panel setup and calibration data
OCL	Output all applicable calibration coefficients for cal type
OCM	Select offset short calibration method
OCS	Output internal buffer collected data
ODAT	Output hard copy tabular data to GPIB
ODR	Output directory listing of the floppy drive
ODRH	Output directory listing of the hard drive
ODV	Output distance values for time domain
OEB	Output extended status byte
OEL	Output error list
OEM	Output extended status byte mask
OFD	Output final data for active channel parameter
OFF	Enter offset value for top graph of active channel
OFF2	Enter offset value for bottom graph of active channel
OFF2?	Output offset value for bottom graph of active channel
OFF?	Output offset value for top graph of active channel
OFP	Output current front panel setup
OFV	Output frequency values
OGCFD	Output gain compression final data to GPIB
OGCFV	Output gain compression frequency values to GPIB
OGCTXT	Output text format gain compression data to GPIB
OGE	Output extended description of current GPIB error

Table 1. Alphabetical Listing of Programming Codes (Mnemonics)

Command	Description
OGL	Output extended description of previous GPIB error
OHDR	Output hard copy header information to GPIB
OHDW	Output hardware cal data to GPIB
OHGL	Output HPGL format data to GPIB
OHM	Suffix sets impedance data type
OID	Output instrument identification string
OLB	Output limits status byte
OLM	Output limits status byte mask
OM1	Output marker 1 value
OM2	Output marker 2 value
OM3	Output marker 3 value
OM4	Output marker 4 value
OM5	Output marker 5 value
OM6	Output marker 6 value
ONCP	Output number of points for current calibration
ONCT	Output number of cal terms for current calibration
ONDF	Output number of discrete frequencies
ONE	Output number of lines in the error list
ONP	Output number of points currently being measured
ONPV	Output the number of power sweep power values
ONRM	Output stored normalization data to GPIB
OPB	Output the 488.2 Status Byte value (same as *STB?)
OPSV	Output power sweep power values
ORD	Output raw data for active channel parameter
OS1	Output front panel setup number 1
OS10	Output front panel setup number 10
OS11C	Output corrected S11 data
OS11R	Output raw S11 data
OS12C	Output corrected S12 data
OS12R	Output raw S12 data
OS2	Output front panel setup number 2
OS21C	Output corrected S21 data
OS21R	Output raw S21 data
OS22C	Output corrected S22 data
OS22R	Output raw S22 data
OS2P	Output S2P format data to GPIB
OS3	Output front panel setup number 3
OS4	Output front panel setup number 4
OS5	Output front panel setup number 5
OS6	Output front panel setup number 6
OS7	Output front panel setup number 7
OS8	Output front panel setup number 8
OS9	Output front panel setup number 9
OSL	Output service log
OTV	Output time values for time domain
OTXT	Output text format data to GPIB
P1C	Select port 1 for connector specification
P1C?	Output port 1 connector type
P1MMN	Set Port 1 Millimeter Wave Head to None
P1MMR	Set Port 1 Millimeter Wave Head to Receiver (3741)
P1MMT	Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740)
P1MMX?	Output Port 1 Millimeter Wave Head type
P1P?	Output approximate power level at port 1
P2C	Select port 2 for connector specification
P2C?	Output port 2 connector type
P2MMN	Set Port 2 Millimeter Wave Head to none
P2MMR	Set Port 2 Millimeter Wave Head to Receiver (3741)
P2MMT	Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740)
P2MMX?	Output Port 2 Millimeter Wave Head type
PBL	Select 1/4 size plot bottom left corner
PBR	Select 1/4 size plot bottom right corner
PCP	Select measurement phase polar chart mode
PCS	Select sweep position polar chart mode
PCX?	Output polar chart mode
PDR	Print directory listing of the floppy drive
PDRH	Print directory listing of the hard drive
PEL	Print the error list
PFL	Select full-size plot

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
PFS	Print full screen image
PGR	Print graph area screen image
PGT	Plot graticule
PHA	Select phase display for active channel
PHO	Enter phase offset for display channel
PHO?	Output phase offset for display channel
PLD	Plot data area only
PLG	Select log polar display for active channel
PLH	Plot header
PLM	Plot markers and limits
PLO?	Output plot mode portrait or landscape
PLR	Select linear polar display for active channel
PLS	Plot entire screen
PLT	Plot data traces only
PMK	Print tabular data for Markers
PMN	Plot menu
PMT	Print tabular data for traces and markers
PORT	Select portrait mode for output plot
POW	Select power out display for active channel
PRT?	Perform printer test and output status
PS	Suffix sets time data type and scales by 1E02
PSC	Suffix sets time data type and scales by 1E02
PSET	Enter target power for gain compression receiver cal
PSET?	Output target power for gain compression receiver cal
PSL	Print the service log
PSP	Enter number of power sweeps for flat power correction (obsolete)
PSP?	Output number of power sweeps for flat power correction (obsolete)
PST	Stop print/plot
PSTEP	Enter power sweep step size
PSTEP?	Output power sweep step size
PSTOP	Enter power sweep stop power
PSTOP?	Output power sweep stop power
PSTRT	Enter power sweep start power
PSTRT?	Output power sweep start power
PSWC	Perform power sweep linearity calibration
PSWC0	Turn power sweep linearity calibration off
PSWC1	Turn power sweep linearity calibration on
PSWCX?	Output power sweep linearity calibration on/off status
PSWP0	Turn power sweep off
PSWP1	Turn power sweep on
PSWPX?	Output power sweep on/off status
PT0	Set tabular printout points skipped to 0
PT1	Set tabular printout points skipped to 1
PT2	Set tabular printout points skipped to 2
PT3	Set tabular printout points skipped to 3
PT4	Set tabular printout points skipped to 4
PT5	Set tabular printout points skipped to 5
PT6	Set tabular printout points skipped to 6
PT7	Set tabular printout points skipped to 7
PT8	Set tabular printout points skipped to 8
PT9	Set tabular printout points skipped to 9
PTB	Print tabular data for Traces
PTL	Select 1/4 size plot top left corner
PTP	Enter the target power for flat power correction
PTP?	Output the target power for flat power correction
PTR	Select 1/4 size plot top right corner
PTS	Enter number of points to be skipped during flat power correction
PTS?	Output number of points to be skipped during flat power correction
PW2	Enter external source power level
PW2?	Output external source power level
PWR	Enter internal source power level
PWR?	Output internal source power level
Q22	Set Millimeter Wave Band to Q Band (WR-22)
RAD	Suffix sets phase data type and scales by 180/pi
RC1	Recall front panel setup number 1 from memory
RC10	Recall front panel setup number 10 from memory
RC2	Recall front panel setup number 2 from memory
RC3	Recall front panel setup number 3 from memory

Table 1. Alphabetical Listing of Programming Codes (Mnemonics)

Command	Description
RC4	Recall front panel setup number 4 from memory
RC5	Recall front panel setup number 5 from memory
RC6	Recall front panel setup number 6 from memory
RC7	Recall front panel setup number 7 from memory
RC8	Recall front panel setup number 8 from memory
RC9	Recall front panel setup number 9 from memory
RD	Remove a disk directory
RDA	Select automatic reference delay calculation
RDD	Enter reference delay in distance for active channel
RDD?	Output reference delay in distance for active channel
RDT	Enter reference delay in time for active channel
RDT?	Output reference delay in time for active channel
RECALL	Recall a data file from disk to a task
REF	Enter reference line for top graph of active channel
REF2	Enter reference line for bottom graph of active channel
REF2?	Output reference line for bottom graph of active channel
REF?	Output reference line for top graph of active channel
REL	Select real display for active channel
REU	Suffix sets real data type
RGZ	Select reflective device greater than Z0
RH0	Select RF off in hold mode
RH1	Select RF on in hold
RHX?	Output RF on/off during hold status
RIM	Select real and imaginary display for active channel
RLZ	Select reflective device less than Z0
RM1	Select reference plane at line 1 midpoint
ROL	Enter reflective device offset length
RPC	Repeat previous calibration
RPO	Enter rear panel dc voltage value
RPO?	Output rear panel dc voltage value
RRP	Select reference plane at reflection plane
RST	Instrument reset (same as *RST)
RST0	Reset instrument front panel memories and reserved parameters
RST1	Reset instrument and front panel memories
RSTCOL	Reset color configuration to default
RSTGC	Reset gain compression parameters to default
RTL	Return to local
RV0	Turn rear panel output voltage off
RV1	Turn rear panel output voltage on
RV1?	Output rear panel output voltage on/off status
RVD	Set rear panel output mode to dc value
RVH	Set rear panel output mode to horizontal
RVL	Set rear panel output mode to lock direction
RVV	Set rear panel output mode to vertical
RVX?	Output rear panel output mode
S	Suffix sets time data type
S11	Measure S11 on active channel
S12	Measure S12 on active channel
S21	Measure S21 on active channel
S22	Measure S22 on active channel
SA1	Enter port 1 source attenuator value
SA1?	Output port 1 source attenuator value
SAMP2	Use 2 samplers for measurements
SAMP3	Use 3 samplers for measurements
SAMP?	Output the number of samplers used for measurements
SAVE	Save a data file to disk
SAVEGC	Save text format gain compression data to disk
SBD	Enter substrate dielectric for microstrip calibration
SBT	Enter substrate thickness for microstrip calibration
SCL	Enter Scale Resolution for top graph of active channel
SCL2	Enter Scale Resolution for bottom graph of active channel
SCL2?	Output Scale Resolution for bottom graph of active channel
SCL?	Output Scale Resolution for top graph of active channel

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
SCM	Select standard calibration method
SDG	Start diagnostics mode
SDR	Select standard receiver mode
SDR?	Output receiver mode
SELINT	Select Internal (normal) test set operation
SELMM	Select Millimeter Wave test set operation
SELSP	Select S-Parameter test set operation
SELXX?	Output the test set selection MMWave/Internal
SETUP	Display setup menu
SFC	Perform flat test port calibration
SFGCA	Select swept frequency gain compression application
SFGCT	Start swept frequency gain compression test
SH1	Set offset short 1 or 2 offset length for offset short calibration
SH2	Set offset short 1 or 2 offset length for offset short calibration
SL1	Select source lock mode
SLC	Clear all segmented limits definitions
SLD	Select sliding load for calibration
SLH	Enter segmented limits horizontal offset
SLH?	Output segmented limits horizontal offset
SLL0	Turn lower segmented limits display off
SLL1	Turn lower segmented limits display on
SLLX?	Output lower segmented limits display on/off status
SLT	Perform SLT internal calibration
SLU0	Turn upper segmented limits display off
SLU1	Turn upper segmented limits display on
SLUX?	Output upper segmented limits display on/off status
SLV	Enter segmented limits vertical offset
SLV?	Output segmented limits vertical offset
SMC	Enter scale and select compressed Smith Chart display
SME	Enter scale and select expanded Smith Chart display
SMI	Select normal Smith Chart for active channel
SMKR	Select marker search marker mode
SOF	Turn off smoothing
SOF?	Output smoothing on/off status
SON	Enter smoothing value and turn on
SON?	Output smoothing value
SPAN	Enter frequency span
SPAN?	Output frequency span
SPD	Enter pen speed percentage
SPGCA	Select swept power gain compression application
SPGCT	Start swept power gain compression test
SPH	Enter active segmented limit horizontal stop position
SPH?	Output active segmented limit horizontal stop position
SPV	Enter active segmented limit vertical stop position
SPV?	Output active segmented limit vertical stop position
SRC1	Select source linearity voltage testing
SRC1?	Output external source 1 existence information
SRC1AC	Select source 1 as active
SRC1AC?	Output source 1 active/inactive status
SRC1ADD	Enter external source 1 GPIB address
SRC1ADD?	Output external source 1 GPIB address
SRC1EX	Select source 1 as external
SRC1EX?	Output source 1 external/internal status
SRC1G0	Turn source 1 GPIB control off
SRC1G1	Turn source 1 GPIB control on
SRC1GX?	Output source 1 GPIB control on/off status
SRC1MOD?	Output external source 1 model/version string
SRC1NA	Select source 1 as not active
SRC1NT	Select source 1 as internal
SRC2	Select source power voltage testing
SRC2?	Output external source 2 existence information
SRC2AC	Select source 2 as active
SRC2AC?	Output source 2 active/inactive status
SRC2ADD	Enter external source 2 GPIB address
SRC2ADD?	Output external source 2 GPIB address
SRC2G0	Turn source 2 GPIB control off

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
SRC2G1	Turn source 2 GPIB control on
SRC2GX?	Output source 2 GPIB control on/off status
SRC2MOD?	Output external Source 2 model/version string
SRC2NA	Select source 2 as not active
SRCH	Enter marker search value
SRCH?	Output marker search value
SRT	Enter start frequency
SRT?	Output start frequency
ST1	Select set on mode
STD	Store trace to memory on active channel
STH	Enter active segmented limit horizontal start position
STH?	Output active segmented limit horizontal start position
STP	Enter stop frequency
STP?	Output stop frequency
STV	Enter active segmented limit vertical start position
STV?	Output active segmented limit vertical start position
SV1	Save front panel setup number 1 to memory
SV10	Save front panel setup number 10 to memory
SV2	Save front panel setup number 2 to memory
SV3	Save front panel setup number 3 to memory
SV4	Save front panel setup number 4 to memory
SV5	Save front panel setup number 5 to memory
SV6	Save front panel setup number 6 to memory
SV7	Save front panel setup number 7 to memory
SV8	Save front panel setup number 8 to memory
SV9	Save front panel setup number 9 to memory
SVB	Save current band definitions
SVBMM	Save and activate the new Millimeter Wave band definitions
SWP	Return to normal sweep mode
SWP?	Output sweep mode
SWPDIR?	Output instantaneous sweep direction forward/reverse
SWR	Select SWR display for active channel
SXX?	Output s parameter or user defined parameter of active channel
T13	Select overlaid channel 1 and 3 display
T24	Select overlaid channel 2 and 4 display
TA2	Enter port 2 test attenuator value
TA2?	Output port 2 test attenuator value
TBP	Select time bandpass mode for active channel
TC1	Take calibration data for port 1
TC2	Take calibration data for port 2
TCD	Take calibration data on one or both ports as necessary
TCM	Select the TRM calibration method
TDC	Select time domain harmonic frequency calibration data points
TDDIST	Set time domain parameter to distance for active channel
TDDIST?	Output active channel time domain parameter distance or time
TDPI0	Turn phasor impulse response off for active channel
TDPI1	Turn phasor impulse response on for active channel
TDPIX?	Output phasor impulse on/off status for active channel
TDTIME	Set time domain parameter to time for active channel
TDX?	Output domain mode for active channel
TEB	Select external trigger executes *DDT definition
TEX	Select external measurement triggering
TIB	Select GPIB measurement triggering
TIME	Enter the system time
TIME?	Output the system time
TIN	Select internal measurement triggering
TK1	Select tracking mode
TLP	Select time lowpass mode for active channel
TLZ	Enter through line impedance for calibration
TOL	Enter through offset length for calibration
TPI	Select time phasor impulse mode for active channel
TPN	Enter pen number for trace overlay data

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
TRCCOL	Enter the color number for memory data
TRCCOL?	Output the color number for memory data
TRS	Trigger/restart sweep
TST	Perform self test and output status (same as *TST?)
TXX?	Output trigger source
U10	Select 10 mil UTF calibration kit
U15	Select 15 mil UTF calibration kit
U25	Select 25 mil UTF calibration kit
UNDOGC	Exit gain compression and undo changes
UPL0	Turn upper limit off
UPL1	Turn upper limit on at current value
UPL20	Turn upper limit off for bottom graph
UPL21	Turn upper limit on at current value for bottom graph
UPL2X?	Output upper limit on/off status for bottom graph
UPLX?	Output upper limit on/off status
US	Suffix sets time data type and scales by 1E-6
US1	Select upper segmented limit 1 as the active segment
US10	Select upper segmented limit 10 as the active segment
US2	Select upper segmented limit 2 as the active segment
US3	Select upper segmented limit 3 as the active segment
US4	Select upper segmented limit 4 as the active segment
US5	Select upper segmented limit 5 as the active segment
US6	Select upper segmented limit 6 as the active segment
US7	Select upper segmented limit 7 as the active segment
US8	Select upper segmented limit 8 as the active segment
US9	Select upper segmented limit 9 as the active segment
USC	Suffix sets time data type and scales by 1E-6
USE	Enter effective dielectric for microstrip calibration
USL	Enter label string for user parameter being defined
USL?	Output label string for user parameter being defined
USR1	Measure user parameter 1 on active channel
USR2	Measure user parameter 2 on active channel
USR3	Measure user parameter 3 on active channel
USR4	Measure user parameter 4 on active channel
USW	Enter microstrip width for microstrip calibration
USZ	Enter microstrip impedance for microstrip calibration
V	Suffix sets voltage data type
V15	Set Millimeter Wave Band to V Band (WR-15)
VLT	Suffix sets voltage data type
VSP	Enter rear panel stop voltage value
VSP?	Output rear panel stop voltage value
VST	Enter rear panel start voltage value
VST?	Output rear panel start voltage value
W10	Set Millimeter Wave Band to W Band (WR-10)
W10E	Set Millimeter Wave Band to extended W Band (WR-10E)
WCO	Enter waveguide cutoff frequency for user defined kit
WFS	Wait full sweep until all display data is valid
WIDE	Use entire display width for graphs
WKD	Select user defined waveguide calibration kit
WKI	Select installed waveguide calibration kit
WLS	Select low sidelobe window shape
WMS	Select minimum sidelobe window shape
WNM	Select nominal window shape
WRT	Select rectangular window shape
WSH1	Enter waveguide short offset 1 for user defined kit
WSH2	Enter waveguide short offset 2 for user defined kit
WSX?	Output window shape
XM3	Suffix sets unitless data type and scales by 1E-3
XMKR?	Output marker mode
XSB?	Output byte order for output data LSB or MSB
XX1	Suffix sets unitless data type

Table 1. *Alphabetical Listing of Programming Codes (Mnemonics)*

Command	Description
XX3	Suffix sets unitless data type and scales by 1E3
ZCT	Enter zoom range center value time or distance
ZCT?	Output zoom range center value
ZSN	Enter zoom range span value time or distance
ZSN?	Output zoom range span value
ZSP	Enter zoom range stop value time or distance
ZSP?	Output zoom range stop value
ZST	Enter zoom range start value time or distance
ZST?	Output zoom range start value

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Adapter Removal Commands
ADPL	Enter electrical length for adapter removal
ADPL?	Output electrical length for adapter removal
IARF	Enter adapter removal files from GPIB and calibrate
	Addressing Commands
ADDFC	Enter frequency counter GPIB address
ADDFC?	Output frequency counter GPIB address
ADDPLT	Enter plotter GPIB address
ADDPLT?	Output plotter GPIB address
ADDPM	Enter power meter GPIB address
ADDPM?	Output power meter GPIB address
SRC1ADD?	Output external source 1 GPIB address
	Calibration Commands
A12	Simulate 12-term calibration
A8R	Simulate 1-path 2-port calibration reverse path
A8T	Simulate 1-path 2-port calibration forward path
ABT	Simulate trans freq response calibration forward and reverse
AFT	Simulate transmission frequency response calibration forward path
ARB	Simulate reflection only calibration both ports
ARF	Simulate reflection only calibration port 1
ARR	Simulate reflection only calibration port 2
ART	Simulate trans freq response calibration reverse path
BBL	Select broadband load for calibration
BBZ	Enter broadband load impedance for calibration
BBZL	Enter broadband load inductance for calibration
BEG	Begin taking calibration data
BPF	Enter break point frequency for 3 line LRL calibration
C12	Select 12 term calibration
C8R	Select 1-path 2-port calibration reverse path
C8T	Select 1-path 2-port calibration forward path
CBT	Select trans freq response calibration forward and reverse

Command	Description
	Calibration Commands (Continued)
CC0	Enter capacitance coefficient 0 for open
CC1	Enter capacitance coefficient 1 for open
CC2	Enter capacitance coefficient 2 for open
CC3	Enter capacitance coefficient 3 for open
CF2	Select female 2.4mm connector for current port
CF3	Select female GPC-3.5 connector for current port
CFC	Select female TNC connector for current port
CFK	Select female K connector for current port
CFN	Select female Type N connector for current port
CFN75	Select Female type N 75-ohm connector for current port
CFS	Select female SMA connector for current port
CFSP	Select Special Female connector for current port
CFT	Select trans freq response calibration forward path
CFV	Select female V connector for current port
CL0	Enter inductive coefficient 0 for short
CL1	Enter inductive coefficient 1 for short
CL2	Enter inductive coefficient 2 for short
CL3	Enter inductive coefficient 3 for short
CM2	Select male 2.4mm connector for current port
CM3	Select male GPC-3.5 connector for current port
CMC	Select male TNC connector for current port
CMK	Select male K connector for current port
CMN	Select male N connector for current port
CMN75	Select Male type N 75-Ohm connector for current port
CMS	Select male SMA connector for current port
CMSP	Select Special Male connector for current port
CMV	Select male V connector for current port
CMX?	Output calibration method
CND	Select user specified connector for current port
CNG	Select GPC-7 connector for current port
COF	Turn error correction off
CON	Turn error correction on
CON?	Output error correction on/off status

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Calibration Commands (Continued)
COO	Enter offset for open for user specified connector
COS	Enter offset for short for user specified connector
CRB	Select reflection only calibration both ports
CRF	Select reflection only calibration port 1
CRR	Select reflection only calibration port 2
CRT	Select trans freq response calibration reverse path
CSF?	Output cal start frequency
CTF?	Output cal stop frequency
CWC	Select CW frequency calibration data points
CXX?	Output calibration type
DFC	Select discrete frequency calibration data points
DFD	Done specifying discrete frequency ranges
DFQ	Enter single discrete frequency
IC2	Input Calibration Coefficient 2
IC3	Enter calibration coefficient 3
IC4	Enter calibration coefficient 4
IC5	Enter calibration coefficient 5
IC6	Enter calibration coefficient 6
IC7	Enter calibration coefficient 7
IC8	Enter calibration coefficient 8
IC9	Enter calibration coefficient 9
ICA	Enter calibration coefficient 10
ICB	Enter calibration coefficient 11
ICC	Enter calibration coefficient 12
ICD	Enter corrected data for active channel parameter
ICF	Enter front panel setup and calibration data
ICL	Enter all applicable calibration coefficients for cal type
IFD	Enter final data for active channel parameter
ISF	Exclude isolation
ISN	Include isolation
KEC	Keep existing calibration data
L1C	Perform LO1 internal calibration
L2C	Perform LO2 internal calibration

Command	Description
	Calibration Commands (Continued)
LCM	Select LRL calibration method
LL1	Enter length of line 1 for LRL calibration
LL2	Enter length of line 2 for LRL calibration
LL3	Enter length of line 3 for LRL calibration
LLZ	Enter line impedance for LRL calibration
LM2	Select a match for the second device during a LRM type calibration
LM3	Select a match for the third device during a LRM type calibration
LR2	Specify 2 line LRL calibration
LR3	Specify 3 line LRL calibration
LTC	Select coaxial transmission line for calibration
LTU	Select microstrip transmission line for calibration
LTW	Select waveguide transmission line for calibration
LTX?	Output line type
MAT	Select matched reflective devices during cal
MIX	Select mixed reflective devices during calibration
NCS	Go to next calibration step
NOC	Select normal calibration data points
OCM	Select offset short calibration method
ONCT	Output number of cal terms for current calibration
P1C	Select port 1 for connector specification
P1C?	Output port 1 connector type
P1P?	Output approximate power level at port 1
P2C	Select port 2 for connector specification
P2C?	Output port 2 connector type
PSP	Enter number of power sweeps for flat power correction (obsolete)
PSP?	Output number of power sweeps for flat power correction (obsolete)
PTS	Enter number of points to be skipped during flat power correction
PTS?	Output number of points to be skipped during flat power correction

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Calibration Commands (Continued)
RGZ	Select reflective device greater than Z0
RLZ	Select reflective device less than Z0
RM1	Select reference plane at line 1 midpoint
ROL	Enter reflective device offset length
RPC	Repeat previous calibration
RRP	Select reference plane at reflection plane
SBD	Enter substrate dielectric for microstrip calibration
SBT	Enter substrate thickness for microstrip calibration
SCM	Select standard calibration method
SFC	Perform flat test port calibration
SH1	Set offset short 1 or 2 offset length for offset short calibration
SH2	Set offset short 1 or 2 offset length for offset short calibration
SLD	Select sliding load for calibration
SLT	Perform SLT internal calibration
TC1	Take calibration data for port 1
TC2	Take calibration data for port 2
TCD	Take calibration data on one or both ports as necessary
TCM	Select the TRM calibration method
TDC	Select time domain harmonic frequency calibration data points
TLZ	Enter through line impedance for calibration
TOL	Enter through offset length for calibration
U10	Select 10 mil UTF calibration kit
U15	Select 15 mil UTF calibration kit
U25	Select 25 mil UTF calibration kit
USE	Enter effective dielectric for microstrip calibration
USW	Enter microstrip width for microstrip calibration
USZ	Enter microstrip impedance for microstrip calibration
WCO	Enter waveguide cutoff frequency for user defined kit
WKD	Select user defined waveguide calibration kit
WKI	Select installed waveguide calibration kit
WSH1	Enter waveguide short offset 1 for user defined kit
WSH2	Enter waveguide short offset 2 for user defined kit

Data Transfer Commands

Command	Description
DPR0	Visible data only OFD format
DPR1	Data pair always OFD format
FMA	Select ASCII data transfer format
FMB	Select IEEE754 64 bit data transfer format
FMC	Select IEEE754 32 bit data transfer format
FMX?	Output data output mode FMA FMB or FMC
IC1	Enter calibration coefficient 1
IC10	Enter calibration coefficient 10
IC11	Enter calibration coefficient 11
IC12	Enter calibration coefficient 12
LSB	Select least significant byte first binary transfer
MSB	Select most significant byte first binary transfer
OAM1	Output channel 1 active marker value
OAM2	Output channel 2 active marker value
OAM3	Output channel 3 active marker value
OAM4	Output channel 4 active marker value
OC1	Output calibration coefficients 1
OC10	Output calibration coefficients 10
OC11	Output calibration coefficients 11
OC12	Output calibration coefficients 12
OC2	Output calibration coefficients 2
OC3	Output calibration coefficients 3
OC4	Output calibration coefficients 4
OC5	Output calibration coefficients 5
OC6	Output calibration coefficients 6
OC7	Output calibration coefficients 7
OC8	Output calibration coefficients 8

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
Data Transfer (Continued)	
Command	**Description**
OC9	Output calibration coefficients 9
OCA	Output calibration coefficient A
OCB	Output calibration coefficient B
OCC	Output calibration coefficient C
OCD	Output corrected data for active channel parameter
OCF	Output front panel setup and calibration data
OCL	Output all applicable calibration coefficients for cal type
ODR	Output directory listing of the floppy drive
ODRH	Output directory listing of the hard drive
ODV	Output distance values for time domain
OEL	Output error list
OFD	Output final data for active channel parameter
OFP	Output current front panel setup
OFV	Output frequency values
OGE	Output extended description of current GPIB error
OGL	Output extended description of previous GPIB error
OID	Output instrument identification string
OLM	Output limits status byte mask
OM1	Output marker 1 value
OM2	Output marker 2 value
OM3	Output marker 3 value
OM4	Output marker 4 value
OM5	Output marker 5 value
OM6	Output marker 6 value
ONCP	Output number of points for current calibration
ONE	Output number of lines in the error list
ORD	Output raw data for active channel parameter
OS1	Output front panel setup number 1
OS10	Output front panel setup number 10
OS2	Output front panel setup number 2
OS3	Output front panel setup number 3
OS4	Output front panel setup number 4

Command	Description
Data Transfer (Continued)	
Command	**Description**
OS5	Output front panel setup number 5
OS6	Output front panel setup number 6
OS7	Output front panel setup number 7
OS8	Output front panel setup number 8
OS9	Output front panel setup number 9
OSL	Output service log
XSB?	Output byte order for output data LSB or MSB
Diagnostics Commands	
ALC	Perform ALC loop internal calibration
DBP	Select distance bandpass mode for active channel
DCA	Select automatic DC term calculation for lowpass
DCO	Select open for DC term for lowpass
DLP	Select distance lowpass mode for active channel
DRL	Diagnostic read latch
DVM	Enter DVM channel number
DWL	Diagnostic write latch
EDG	End diagnostics mode
EXD	Display external A/D input
FLC	Source frequency linearity internal calibration
FPX?	Output flat power correction on/off status
IFB	Select 1st IF bandpass testing
LKS0	Disable lock search mode
LKS1	Enable lock search mode
LO11	Select LO1 phase lock voltage testing
LO12	Select LO1 D/A voltage testing
LO21	Select LO2 main phase lock voltage testing
LO22	Select LO2 offset phase lock voltage testing
LO23	Select LO2 DDS phase lock voltage testing
LO24	Select LO2 main D/A voltage testing
LO25	Select LO2 offset D/A voltage testing
NRD	Display non-ratioed parameters on 4 channels

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Diagnostics (Continued)
PSL	Print the service log
SDG	Start diagnostics mode
SDR	Select standard receiver mode
SRC1	Select source linearity voltage testing
	Disk Function
ADRIVE	Select the floppy drive as the default drive
CD	Change default directory
CDRIVE	Select the hard disk as the default drive
COPY	Copy a files contents to another file
CWD?	Output current working directory string
DEL	Delete a file from disk
DIR	Output a directory listing to the GPIB
DISKRD	Output disk file data to the GPIB
DISKWR	Write GPIB data to a disk file
EXISTD?	Output directory existence information
EXISTF?	Output file existence information
INT	Initialize (format) floppy disk
LDARF	Load adapter removal files from disk and calibrate
LKT	Load calibration kit information from floppy disk
MD	Create a new disk directory
PDR	Print directory listing of the floppy drive
PDRH	Print directory listing of the hard drive
PGT	Plot graticule
RD	Remove a disk directory
RECALL	Recall a data file from disk to a task
SAVE	Save a data file to disk
SAVEGC	Save text format gain compression data to disk
	Display
ADD	Select addition as trace math for active channel
APR	Enter group delay aperture setting on active channel

Command	Description
	Display (Continued)
APR?	Output group delay aperture setting on active channel
ASC	Autoscale the active channel display
ASP	Enter polar stop sweep position angle
ASP?	Output polar stop sweep position angle
AST	Enter polar start sweep position angle
AST?	Output polar start sweep position angle
DAT	Display data only on active channel
DAT?	Output trace memory display mode
DIA	Select air as active dielectric
DIE	Enter a dielectric value
DIM	Select microporous teflon as active dielectric
DIP	Select polyethylene as active dielectric
DIT	Select Teflon as active dielectric
DIV	Select division as trace math for active channel
DIX?	Output dielectric constant
DLA	Select group delay display for active channel
DNM	Display data normalized to trace memory on active channel
DTM	Display measurement data and trace memory on active channel
GRF?	Output graph type for active channel
IMG	Select imaginary display for active channel
ISC	Enter scale and select inverted compressed Smith Chart display
ISE	Enter scale and select inverted expanded Smith Chart display
ISM	Select normal inverted Smith Chart for active channel
LIN	Select linear magnitude display for active channel
LPH	Select linear magnitude and phase display for active channel
MAG	Select log magnitude display for active channel
MEM	Display trace memory on active channel
MIN	Select subtraction as trace math for active channel
MPH	Select log magnitude and phase display for active channel

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Display (Continued)
MTH?	Output trace math math type
MUL	Select multiplication as trace math for active channel
OFF	Enter offset value for top graph of active channel
OFF2	Enter offset value for bottom graph of active channel
OFF2?	Output offset value for bottom graph of active channel
OFF?	Output offset value for top graph of active channel
PCP	Select measurement phase polar chart mode
PCS	Select sweep position polar chart mode
PCX?	Output polar chart mode
PHA	Select phase display for active channel
PHO	Enter phase offset for display channel
PHO?	Output phase offset for display channel
PLG	Select log polar display for active channel
PLR	Select linear polar display for active channel
POW	Select power out display for active channel
RDA	Select automatic reference delay calculation
RDD	Enter reference delay in distance for active channel
RDD?	Output reference delay in distance for active channel
RDT	Enter reference delay in time for active channel
RDT?	Output reference delay in time for active channel
REF	Enter reference line for top graph of active channel
REF2	Enter reference line for bottom graph of active channel
REF2?	Output reference line for bottom graph of active channel
REF?	Output reference line for top graph of active channel
REL	Select real display for active channel
RIM	Select real and imaginary display for active channel
SCL	Enter Scale Resolution for top graph of active channel
SCL2	Enter Scale Resolution for bottom graph of active channel

Command	Description
	Display (Continued)
SCL2?	Output Scale Resolution for bottom graph of active channel
SCL?	Output Scale Resolution for top graph of active channel
SETUP	Display setup menu
SMC	Enter scale and select compressed Smith Chart display
SME	Enter scale and select expanded Smith Chart display
SMI	Select normal Smith Chart for active channel
STD	Store trace to memory on active channel
SWR	Select SWR display for active channel
	Enhancement
AOF	Turn averaging off
AOF?	Output averaging on/off status
AON	Turn averaging on
AVG	Enter averaging count and turn on
AVG?	Output averaging count
IF1	Select 10 Hz IF bandwidth
IF2	Select 100 Hz IF bandwidth
IF3	Select 1 KHz IF bandwidth
IF4	Select 10 KHz IF bandwidth
IFA	Select 30 KHz IF bandwidth
IFM	Select 10 Hz IF bandwidth
IFN	Select 1 KHz IF bandwidth
IFR	Select 100 Hz IF bandwidth
IFX?	Output IF bandwidth
SOF	Turn off smoothing
SOF?	Output smoothing on/off status
SON	Enter smoothing value and turn on
SON?	Output smoothing value
	Fast CW
FCW0	Turn fast CW measurement mode off
FCW1	Turn fast CW measurement mode on
FCW2	Turn Fast CW mode 2 on

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Fast CW (Continued)
FCWX?	Output fast CW measurement mode on/off status
	Gain Compression
CALR	Perform receiver cal for gain compression testing
GCMP	Enter gain compression point search value
GCMP?	Output gain compression point search value
MFGCT	Start multiple frequency swept power gain compression test
NOFST	Enter nominal offset value for external gain
NOFST?	Output nominal offset value for external gain
NRMS	Normalize S21 for gain compression testing
PSET	Enter target power for gain compression receiver cal
PSET?	Output target power for gain compression receiver cal
PSTEP	Enter power sweep step size
PSTEP?	Output power sweep step size
PSTOP	Enter power sweep stop power
PSTOP?	Output power sweep stop power
PSTRT	Enter power sweep start power
PSTRT?	Output power sweep start power
PSWC	Perform power sweep linearity calibration
PSWC0	Turn power sweep linearity calibration off
PSWC1	Turn power sweep linearity calibration on
PSWCX?	Output power sweep linearity calibration on/off status
PSWP0	Turn power sweep off
PSWP1	Turn power sweep on
PSWPX?	Output power sweep on/off status
RSTGC	Reset gain compression parameters to default
SFGCA	Select swept frequency gain compression application
SFGCT	Start swept frequency gain compression test
SPGCA	Select swept power gain compression application
SPGCT	Start swept power gain compression test

Command	Description
	Gain Compression (Continued)
UNDOGC	Exit gain compression and undo changes
	Hard Copy
BMPB	Select Black on White as bitmap type
BMPC	Select Color on White as bitmap type
BMPT	Select true color as bitmap type
DPN	Enter pen number for data
FFD	Send form feed to printer and stop print/plot
GPN	Enter pen number for graticule
HD0	Turn off tabular data headers and page formatting
HD1	Turn on tabular data headers and page formatting
HPN	Enter pen number for header
LAND	Select landscape mode for output plot
LDT0	Disable printing date/time
LDT1	Enable printing date/time
LMS	Enter string for DUT model/serial number
LOC	Enter string for operator comment
LOC?	Output string for operator comment
LOGO0	Turn hard copy logo off
LOGO1	Turn hard copy logo on
LOGO?	Output hard copy logo selection standard/user defined
LOGOS	Select standard hard copy logo
LOGOU	Select user defined hard copy logo
LOGOX?	Output hard copy logo on/off status
OBMP	Output the display as a bitmap
ODAT	Output hard copy tabular data to GPIB
OGCTXT	Output text format gain compression data to GPIB
OHDR	Output hard copy header information to GPIB
OHGL	Output HPGL format data to GPIB
OS2P	Output S2P format data to GPIB
OTXT	Output text format data to GPIB
PBL	Select 1/4 size plot bottom left corner

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Hard Copy (Continued)
PBR	Select 1/4 size plot bottom right corner
PFL	Select full-size plot
PFS	Print full screen image
PGR	Print graph area screen image
PLD	Plot data area only
PLH	Plot header
PLM	Plot markers and limits
PLO?	Output plot mode portrait or landscape
PLS	Plot entire screen
PLT	Plot data traces only
PMK	Print tabular data for Markers
PMN	Plot menu
PMT	Print tabular data for traces and markers
PORT	Select portrait mode for output plot
PST	Stop print/plot
PT0	Set tabular printout points skipped to 0
PT1	Set tabular printout points skipped to 1
PT2	Set tabular printout points skipped to 2
PT3	Set tabular printout points skipped to 3
PT4	Set tabular printout points skipped to 4
PT5	Set tabular printout points skipped to 5
PT6	Set tabular printout points skipped to 6
PT7	Set tabular printout points skipped to 7
PT8	Set tabular printout points skipped to 8
PT9	Set tabular printout points skipped to 9
PTB	Print tabular data for Traces
PTL	Select 1/4 size plot top left corner
PTR	Select 1/4 size plot top right corner
SPD	Enter pen speed percentage
TPN	Enter pen number for trace overlay data
	IEEE 488.2
*CLSF	Clear status bytes and structures
*DDT	Enter the 488.2 Define Device Trigger command string

Command	Description
	IEEE 488.2 (Continued)
*DDT?	Output the 488.2 Define Device Trigger command string
*ESE	Enter the 488.2 Standard Event Status Enable mask
*ESE?	Output the 488.2 Standard Event Status Enable mask
*ESR?	Output the 488.2 Standard Event Status Register value
*IDN?	Output the 488.2 instrument identification string
*IST?	Output the value of the ist message
*OPC	Initiate the 488.2 Operation Complete sequence
*OPC?	Initiate the 488.2 Operation Complete Query sequence
*PRE	Enter the 488.2 Parallel Poll Register Enable mask
*PRE?	Output the 488.2 Parallel Poll Register Enable mask
*RST	Instrument reset
*SRE	Enter the 488.2 Service Request Enable mask
*SRE?	Output the 488.2 Service Request Enable mask
*STB?	Output the 488.2 Status Byte value
*TRG	Initiate a Group Execute Trigger sequence
*TST?	Perform self test and output status
*WAI	Wait to continue
OPB	Output the 488.2 Status Byte value (same as *STB?)
TST	Perform self test and output status (same as *TST?)
	Internal Data Buffer Collection
CCD	Collect corrected data in an internal buffer
CFD	Collect final data in an internal buffer
CRD	Collect raw data in an internal buffer
CXD?	Output internal buffer data collection mode
DCCTN	Resume internal buffer data collection
DCCTN?	Output internal buffer data collection resume/suspend status
DCHLD	Suspend internal buffer data collection
DCMRK	Inserts the mark value into the internal buffer

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
Internal Data Buffer Collection (Continued	
DCOFF	Turn internal buffer data collection mode off
OCS	Output internal buffer collected data
Limits	
ATTN	Attach next segment and make the active segment
BEGN	Begin next segment and make it the active segment
CAS	Clear active segmented limit vertical/horizontal definitions
DIS	Display active segmented limit
DIS?	Output active segmented limit on/off status
HID	Hide active segmented limit
LB0	Turn limits testing beep on failure off
LB1	Turn limits testing beep on failure on
LBX?	Output limits testing beeper enable status
LFD	Enter limit frequency readout delta value
LFD2	Enter limit frequency readout delta value for bottom graph
LFD2?	Output limit frequency readout delta value for bottom graph
LFD?	Output limit frequency readout delta value
LFP	Select limit frequency readout for phase displays
LFR	Select limit frequency readout for active channel
LLM?	Output limit line display mode single or segmented
LLO	Enter lower limit value for top graph on active channel
LLO2	Enter lower limit value for bottom graph on active channel
LLO2?	Output lower limit value for bottom graph on active channel
LLO?	Output lower limit value for top graph on active channel
LOF	Limits display off
LOL0	Turn lower limit off
LOL1	Turn lower limit on at current value
Limits (Continued)	
LOL20	Turn lower limit off for bottom graph
LOL21	Turn lower limit on at current value for bottom graph
LOL2X?	Output lower limit on/off status for bottom graph
LOLX?	Output lower limit on/off status
LON	Limits display on
LON?	Output limits display on/off status
LPF1?	Output limit test failure status on channel 1
LPF2?	Output limit test failure status on channel 2
LPF3?	Output limit test failure status on channel 3
LPF4?	Output limit test failure status on channel 4
LPF?	Output limit test failure status all channels
LS1	Set lower segmented limit 100 as the active segment
LS10	Select lower segmented limit 10 as the active segment
LS2	Select lower segmented limit 2 as the active segment
LS3	Select lower segmented limit 3 as the active segment
LS4	Select lower segmented limit 4 as the active segment
LS5	Select lower segmented limit 5 as the active segment
LS6	Select lower segmented limit 6 as the active segment
LS7	Select lower segmented limit 7 as the active segment
LS8	Select lower segmented limit 8 as the active segment
LS9	Select lower segmented limit 9 as the active segment
LSEG	Select segmented limit line display mode
LSNG	Select single limit line display mode
LSX?	Output active segmented limit
LT0	Turn limits testing off
LT1	Turn limits testing on
LT1?	Output limits testing enable status
LTST	Display the limits testing menu

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Limits (Continued)
LUP	Enter upper limit value for top graph on active channel
LUP2	Enter upper limit value for bottom graph on active channel
LUP2?	Output upper limit value for bottom graph on active channel
LUP?	Output upper limit value for top graph on active channel
LVH	Select high as limits testing TTL level
LVL	Select low as limits testing TTL level
LVX?	Output limits testing ttl level status
SLC	Clear all segmented limits definitions
SLH	Enter segmented limits horizontal offset
SLH?	Output segmented limits horizontal offset
SLL0	Turn lower segmented limits display off
SLL1	Turn lower segmented limits display on
SLLX?	Output lower segmented limits display on/off status
SLU0	Turn upper segmented limits display off
SLU1	Turn upper segmented limits display on
SLV	Enter segmented limits vertical offset
SLV?	Output segmented limits vertical offset
SPH	Enter active segmented limit horizontal stop position
SPH?	Output active segmented limit horizontal stop position
SPV	Enter active segmented limit vertical stop position
SPV?	Output active segmented limit vertical stop position
STH	Enter active segmented limit horizontal start position
STH?	Output active segmented limit horizontal start position
STV	Enter active segmented limit vertical start position
STV?	Output active segmented limit vertical start position
UPL0	Turn upper limit off

Command	Description
	Limits (Continued)
UPL1	Turn upper limit on at current value
UPL20	Turn upper limit off for bottom graph
UPL21	Turn upper limit on at current value for bottom graph
UPL2X?	Output upper limit on/off status for bottom graph
UPLX?	Output upper limit on/off status
US1	Select upper segmented limit 1 as the active segment
US10	Select upper segmented limit 10 as the active segment
US2	Select upper segmented limit 2 as the active segment
US3	Select upper segmented limit 3 as the active segment
US4	Select upper segmented limit 4 as the active segment
US5	Select upper segmented limit 5 as the active segment
US6	Select upper segmented limit 6 as the active segment
US7	Select upper segmented limit 7 as the active segment
US8	Select upper segmented limit 8 as the active segment
US9	Select upper segmented limit 9 as the active segment
	Markers
AMKR	Select active marker on all channels marker mode
BWL3	Set bandwidth loss value to 3 dB
BWLS	Enter bandwidth loss value
BWLS?	Output bandwidth loss value
DR1	Select Marker 1 as Delta Reference Marker
DR2	Select Marker 2 as Delta Reference Marker
DR3	Select Marker 3 as Delta Reference Marker
DR4	Select Marker 4 as Delta Reference Marker
DR5	Select Marker 5 as Delta Reference Marker
DR6	Select Marker 6 as Delta Reference Marker
DRF	Turn delta reference mode on

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Markers (Continued)
DRO	Turn delta reference mode off
DRO?	Output delta reference mode on/off status
DRX?	Output delta reference marker number
DSF0	Disable filter shape factor calculation
DSF1	Enable filter shape factor calculation
DSFX?	Output filter shape factor calculation enable/disable status
DSQ0	Disable filter Q calculation
DSQ1	Enable filter Q calculation
DSQX?	Output filter Q calculation enable/disable status
FLTBW?	Output filter bandwidth
FLTC?	Output filter center frequency
FLTL?	Output filter loss at reference value
FLTQ?	Output filter Q
FLTS?	Output filter shape factor
FMKR	Select filter parameters marker mode
M1C	Set CW mode at marker 1 frequency
M1E	Set sweep/zoom end to marker 1 frequency distance or time
M1S	Set sweep/zoom start to marker 1 frequency distance or time
M2C	Set CW mode at marker 2 frequency
M2E	Set sweep/zoom end to marker 2 frequency distance or time
M2S	Set sweep/zoom start to marker 2 frequency distance or time
M3C	Set CW mode at marker 3 frequency
M3E	Set sweep/zoom end to marker 3 frequency distance or time
M3S	Set sweep/zoom start to marker 3 frequency distance or time
M4C	Set CW mode at marker 4 frequency
M4E	Set sweep/zoom end to marker 4 frequency distance or time
M4S	Set sweep/zoom start to marker 4 frequency distance or time
M5C	Set CW mode at marker 5 frequency

Command	Description
	Markers (Continued)
M5E	Set sweep/zoom end to marker 5 frequency distance or time
M5S	Set sweep/zoom start to marker 5 frequency distance or time
M6C	Set CW mode at marker 6 frequency
M6E	Set sweep/zoom end to marker 6 frequency distance or time
M6S	Set sweep/zoom start to marker 6 frequency distance or time
MK1	Enter marker 1 frequency distance or time and turn on
MK1?	Output marker 1 frequency distance or time
MK2	Enter marker 2 frequency distance or time and turn on
MK2?	Output marker 2 frequency distance or time
MK3	Enter marker 3 frequency distance or time and turn on
MK3?	Output marker 3 frequency distance or time
MK4	Enter marker 4 frequency distance or time and turn on
MK4?	Output marker 4 frequency distance or time
MK5	Enter marker 5 frequency distance or time and turn on
MK5?	Output marker 5 frequency distance or time
MK6	Enter marker 6 frequency distance or time and turn on
MK6?	Output marker 6 frequency distance or time
MKRC	Select interpolated marker functionality
MKRD	Select discrete marker functionality
MKRX?	Output interpolated/discrete marker functionality
MKSL	Marker search left
MKSR	Marker search right
MKT0	Turn marker tracking off
MKT1	Turn marker tracking on
MKTX?	Output marker tracking on/off status
MMN	Move active marker to minimum trace value
MMX	Move active marker to maximum trace value
MO1	Turn off marker 1

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Markers (Continued)
MO2	Turn off marker 2
MO3	Turn off marker 3
MO4	Turn off marker 4
MO5	Turn off marker 5
MO6	Turn off marker 6
MOF	Turn marker display off
MON	Turn marker display on
MON?	Output marker display on/off status
MR1	Turn marker 1 on and make it the active marker
MR1?	Output marker 1 on/off status
MR2	Turn marker 2 on and make it the active marker
MR2?	Output marker 2 on/off status
MR3	Turn marker 3 on and make it the active marker
MR3?	Output marker 3 on/off status
MR4	Turn marker 4 on and make it the active marker
MR4?	Output marker 4 on/off status
MR5	Turn marker 5 on and make it the active marker
MR5?	Output marker 5 on/off status
MR6	Turn marker 6 on and make it the active marker
MR6?	Output marker 6 on/off status
MRM	Display the Marker Readout menu
MRX?	Output active marker number
MSFH	Enter high loss value for shape factor calculation
MSFH?	Output high loss value for shape factor calculation
MSFL	Enter low loss value for shape factor calculation
MSFL?	Output low loss value for shape factor calculation
MSR0	Select 0 as reference for marker search and bandwidth calculation
MSRD	Select delta reference marker as reference for marker search and bandwidth calculation
MSRM	Select maximum as reference for marker search and bandwidth calculation
MSRX?	Output reference selection for marker search and bandwidth calculation

Command	Description
	Markers (Continued)
NMKR	Select normal markers on active channel marker mode
SMKR	Select marker search marker mode
SRCH	Enter marker search value
SRCH?	Output marker search value
XMKR?	Output marker mode
	Measurement
AH0	Turn automatic DUT protection off
AH1	Turn automatic DUT protection on
AHX?	Output automatic DUT protection on/off status
BH0	Turn bias off while in hold
BH1	Turn bias on while in hold
BHX?	Output bias on/off during hold status
CNTR	Enter center frequency
CNTR?	Output center frequency
CTN	Continue sweeping from current point
CWF	Enter CW frequency and turn CW on
CWF?	Output CW frequency
CWON	Turn CW on at current CW frequency
CWON?	Output CW on/off status
CWP	Enter number of points drawn in CW
CWP?	Output number of points drawn in CW
FHI	Set data points to 1601
FIL	Fill defined discrete frequency range
FLO	Set data points to 101
FME	Set data points to 401
FP0	Turn flat power correction off
FP1	Turn flat power correction on
FRC	Clear all defined discrete frequency ranges
FRI	Enter Discrete Fill increment frequency
FRP	Enter Discrete Fill number of points
FRS	Enter Discrete Fill start frequency
HC0	Disable internal IF calibration

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Measurement (Continued)
HC1	Enable internal IF calibration and trigger an IF calibration
HCT	Trigger an IF calibration
HCX?	Output internal IF calibration enable/disable status
HLD	Put sweep into hold mode
HLD?	Output the sweep hold status
IFP	Enter current front panel setup
IFV	Enter frequency values
IS1	Enter front panel setup 1
IS10	Enter front panel setup 10
IS2	Enter front panel setup 2
IS3	Enter front panel setup 3
IS4	Enter front panel setup 4
IS5	Enter front panel setup 5
IS6	Enter front panel setup 6
IS7	Enter front panel setup 7
IS8	Enter front panel setup 8
IS9	Enter front panel setup 9
LA1	Select a1 = Ra as phase lock for parameter being defined
LA2	Select a2 = Rb as phase lock for parameter being defined
LAX?	Output phase lock selection for parameter being defined
NP101	Set data points to 101
NP1601	Set data points to 1601
NP201	Set data points to 201
NP401	Set data points to 401
NP51	Set data points to 51
NP801	Set data points to 801
ONDF	Output number of discrete frequencies
PTP	Enter the target power for flat power correction
PTP?	Output the target power for flat power correction
PW2	Enter external source power level
PW2?	Output external source power level

Command	Description
	Measurement (Continued)
PWR	Enter internal source power level
PWR?	Output internal source power level
RH0	Select RF off in hold mode
RH1	Select RF on in hold
RHX?	Output RF on/off during hold status
S11	Measure S11 on active channel
S12	Measure S12 on active channel
S21	Measure S21 on active channel
S22	Measure S22 on active channel
SA1	Enter port 1 source attenuator value
SA1?	Output port 1 source attenuator value
SAMP2	Use 2 samplers for measurements
SAMP3	Use 3 samplers for measurements
SAMP?	Output the number of samplers used for measurements
SELSP	Select S-Parameter test set operation
SPAN	Enter frequency span
SPAN?	Output frequency span
SRC2?	Output external source 2 existence information
SRT	Enter start frequency
SRT?	Output start frequency
STP	Enter stop frequency
STP?	Output stop frequency
SWP	Return to normal sweep mode
SWP?	Output sweep mode
SWPDIR?	Output instantaneous sweep direction forward/reverse
SXX?	Output s parameter or user defined parameter of active channel
TA2	Enter port 2 test attenuator value
TA2?	Output port 2 test attenuator value
TEX	Select external measurement triggering
TIN	Select internal measurement triggering
TRS	Trigger/restart sweep
TXX?	Output trigger source
WFS	Wait full sweep until all display data is valid

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Measurement Data (Ch 7)
DPRX?	Output data pair mode visible only or pair always
OGCFD	Output gain compression final data to GPIB
OGCFV	Output gain compression frequency values to GPIB
ONP	Output number of points currently being measured
ONPV	Output the number of power sweep power values
OPSV	Output power sweep power values
OS11C	Output corrected S11 data
OS11R	Output raw S11 data
OS12C	Output corrected S12 data
OS12R	Output raw S12 data
OS21C	Output corrected S21 data
OS21R	Output raw S21 data
OS22C	Output corrected S22 data
OS22R	Output raw S22 data
OTV	Output time values for time domain
	Millimeter Wave
BDMM	Define Millimeter Wave band equations
CLBMM	Clear the new Millimeter Wave band definitions
E12	Set Millimeter Wave band to E band (WR-12)
E12E	Set Millimeter Wave band to E band (WR-12)
MMBX?	Output Millimeter Wave band selection
P1MMN	Set Port 1 Millimeter Wave Head to None
P1MMR	Set Port 1 Millimeter Wave Head to Receiver (3741)
P1MMT	Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740)
P1MMX?	Output Port 1 Millimeter Wave Head type
P2MMN	Set Port 2 Millimeter Wave Head to none
P2MMR	Set Port 2 Millimeter Wave Head to Receiver (3741)
P2MMT	Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740)

Command	Description
	Millimeter Wave (Continued)
P2MMX?	Output Port 2 Millimeter Wave Head type
Q22	Set Millimeter Wave Band to Q Band (WR-22)
SELINT	Select Internal (normal) test set operation
SELMM	Select Millimeter Wave test set operation
SELXX?	Output the test set selection MMWave/Internal
SVBMM	Save and activate the new Millimeter Wave band definitions
V15	Set Millimeter Wave Band to V Band (WR-15)
W10	Set Millimeter Wave Band to W Band (WR-10)
W10E	Set Millimeter Wave Band to extended W Band (WR-10E)
	Multiple Source
BD1	Select band 1 for definition
BD2	Select band 2 for definition
BD3	Select band 3 for definition
BD4	Select band 4 for definition
BD5	Select band 5 for definition
BSP	Enter band stop frequency
BSP?	Output band stop frequency
BST	Enter band start frequency
BST?	Output band start frequency
CLB	Clear all multiple source band definitions
ECW	Select CW operation for component being edited
ED1	Edit source 1 equation
ED2	Edit source 2 equation
EDR	Edit receiver equation
EDV	Enter divisor value for equation being edited
EDV?	Output divisor value for equation being edited
EML	Enter multiplier value for equation being edited
EML?	Output multiplier value for equation being edited
EOS	Enter offset frequency for equation being edited
EOS?	Output offset frequency for equation being edited

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Multiple Source (Continued)
ESW	Select sweep operation for component being edited
EXW?	Output multiple source sweep flag for equation being edited
MS0	Turn multiple source mode off
MS1	Turn multiple source mode on
MSD	Select multiple source define mode
MSX?	Output multiple source mode on/off/define
SRC1?	Output external source 1 existence information
SRC1AC	Select source 1 as active
SRC1AC?	Output source 1 active/inactive status
SRC1ADD	Enter external source 1 GPIB address
SRC1EX	Select source 1 as external
SRC1EX?	Output source 1 external/internal status
SRC1G0	Turn source 1 GPIB control off
SRC1G1	Turn source 1 GPIB control on
SRC1GX?	Output source 1 GPIB control on/off status
SRC1MOD?	Output external source 1 model/version string
SRC1NA	Select source 1 as not active
SRC1NT	Select source 1 as internal
SRC2	Select source power voltage testing
SRC2AC	Select source 2 as active
SRC2AC?	Output source 2 active/inactive status
SRC2ADD	Enter external source 2 GPIB address
SRC2ADD?	Output external source 2 GPIB address
SRC2G0	Turn source 2 GPIB control off
SRC2G1	Turn source 2 GPIB control on
SRC2GX?	Output source 2 GPIB control on/off status
SRC2MOD?	Output external Source 2 model/version string
SRC2NA	Select source 2 as not active
SVB	Save current band definitions
	Rear Panel
RPO	Enter rear panel dc voltage value
RPO?	Output rear panel dc voltage value
RV0	Turn rear panel output voltage off
	Rear Panel (Continued)
RV1	Turn rear panel output voltage on
RV1?	Output rear panel output voltage on/off status
RVD	Set rear panel output mode to dc value
RVH	Set rear panel output mode to horizontal
RVL	Set rear panel output mode to lock direction
RVV	Set rear panel output mode to vertical
RVX?	Output rear panel output mode
VSP	Enter rear panel stop voltage value
VSP?	Output rear panel stop voltage value
VST	Enter rear panel start voltage value
VST?	Output rear panel start voltage value
	Receiver Mode
SDR?	Output receiver mode
SL1	Select source lock mode
ST1	Select set on mode
TK1	Select tracking mode
	Save/Recall
RC1	Recall front panel setup number 1 from memory
RC10	Recall front panel setup number 10 from memory
RC2	Recall front panel setup number 2 from memory
RC3	Recall front panel setup number 3 from memory
RC4	Recall front panel setup number 4 from memory
RC5	Recall front panel setup number 5 from memory
RC6	Recall front panel setup number 6 from memory
RC7	Recall front panel setup number 7 from memory
RC8	Recall front panel setup number 8 from memory
RC9	Recall front panel setup number 9 from memory
SV1	Save front panel setup number 1 to memory
SV10	Save front panel setup number 10 to memory
SV2	Save front panel setup number 2 to memory
SV3	Save front panel setup number 3 to memory
SV4	Save front panel setup number 4 to memory
SV5	Save front panel setup number 5 to memory
SV6	Save front panel setup number 6 to memory

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	Save/Recall (Continued)
SV7	Save front panel setup number 7 to memory
SV8	Save front panel setup number 8 to memory
SV9	Save front panel setup number 9 to memory
	System State
ANNCOL	Enter the color number for annotation and menu text
ANNCOL?	Output the color number for annotation and menu text
BC0	Turn CRT display off (disabled)
BC1	Turn CRT display on (disabled)
BCKCOL	Enter the color number for background
BCKCOL?	Output the color number for background
BCX?	Output CRT display on/off status
BEEP0	Disable the instrument beeper on GPIB errors
BEEP1	Enable the instrument beeper on GPIB errors
BEEPX?	Output GPIB beep on error enable/disable status
DATCOL	Enter the color number for data
DATCOL?	Output the color number for data
DATE	Enter the system date
DATE?	Output the system date
DC1	Display channel 1 and 2 operating parameters
DC3	Display channel 3 and 4 operating parameters
DCP	Display calibration parameters 1st page
DCP1	Display calibration parameters 1st page
DCP2	Display calibration parameters 2nd page
DD0	Turn data drawing off
DD1	Turn data drawing on
DD1?	Output data drawing on/off status
DF2	Display 2.4mm female connector information
DF3	Display GPC-3.5 female connector information
DFK	Display K female connector information
DFN	Display N female connector information
DFN75	Display N Female 75-Ohm connector information
DFP	Display Front panel instrument state
DFS	Display SMA female connector information

Command	Description
	System State (Continued)
DFSP	Display Special Female connector information
DFT	Display TNC female connector information
DFV	Display V female connector information
DG7	Display GPC-7 Male connector information
DGS	Display GPIB status information
DM2	Display 2.4mm male connector information
DM3	Display GPC-3.5 male connector information
DMK	Display K male connector information
DMN	Display N male connector information
DMN75	Display N Male 75-Ohm connector information
DMS	Display SMA male connector information
DMSP	Display Special Male connector information
DMT	Display TNC male connector information
DMV	Display V male connector information
DWG	Display waveguide parameters
FOF	Blank frequency information
FON	Display frequency information
FOX?	Output frequency information on/off status
GRTCOL	Enter the color number for the graticule
GRTCOL?	Output the color number for the graticule
LAYCOL	Enter the color number for overlay data
LAYCOL?	Output the color number for overlay data
MKRCOL	Enter the color number for the markers
MKRCOL?	Output the color number for the markers
MNUCOL	Enter the color number for the menu headers
MNUCOL?	Output the color number for the menu headers
RST	Instrument reset (same as *RST)
RST0	Reset instrument front panel memories and reserved parameters
RST1	Reset instrument and front panel memories
RSTCOL	Reset color configuration to default
RTL	Return to local
TIME	Enter the system time
TIME?	Output the system time
TRCCOL	Enter the color number for memory data

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	System State (Continued)
TRCCOL?	Output the color number for memory data
WIDE	Use entire display width for graphs
	Time Domain
DCS	Select short for DC term for lowpass
DCV	Enter value for DC term for lowpass
DCV?	Output lowpass DC term value
DCX?	Output lowpass DC term selection
DCZ	Select line impedance for DC term for lowpass
DDX?	Output active channel domain parameter frequency distance or time
DPI	Select distance phasor impulse mode for active channel
FGT	Select frequency with time gate for active channel
FQD	Select frequency domain for active channel
GCT	Enter gate center value distance or time
GCT?	Output gate center value
GDS	Gate symbols displayed on active channel
GLS	Select low sidelobe gate shape
GMS	Select minimum sidelobe gate shape
GNM	Select nominal gate shape
GOF	Turn off gating on active channel
GOF?	Output gating mode on active channel
GON	Turn on gating on active channel
GRT	Select Rectangular gate shape
GSN	Enter gate span value distance or time
GSN?	Output gate span value
GSP	Enter gate stop value distance or time
GSP?	Output gate stop value
GST	Enter gate start value distance or time
GST?	Output gate start value
GSX?	Output gate shape
LPI	Select lowpass impulse response for active channel
LPS	Select lowpass step response for active channel

Command	Description
	Time Domain (Continued)
LPSX?	Output lowpass response for active channel impulse or step
MRR	Restore original marker range
TBP	Select time bandpass mode for active channel
TDDIST	Set time domain parameter to distance for active channel
TDDIST?	Output active channel time domain parameter distance or time
TDPI0	Turn phasor impulse response off for active channel
TDPI1	Turn phasor impulse response on for active channel
TDPIX?	Output phasor impulse on/off status for active channel
TDTIME	Set time domain parameter to time for active channel
TDX?	Output domain mode for active channel
TLP	Select time lowpass mode for active channel
TPI	Select time phasor impulse mode for active channel
WLS	Select low sidelobe window shape
WMS	Select minimum sidelobe window shape
WNM	Select nominal window shape
WRT	Select rectangular window shape
WSX?	Output window shape
ZCT	Enter zoom range center value time or distance
ZCT?	Output zoom range center value
ZSN	Enter zoom range span value time or distance
ZSN?	Output zoom range span value
ZSP	Enter zoom range stop value time or distance
ZSP?	Output zoom range stop value
ZST	Enter zoom range start value time or distance
ZST?	Output zoom range start value
	Triggers
TEB	Select external trigger executes *DDT definition
TIB	Select GPIB measurement triggering

Table 2. 37XXX Programming Code, Functional Grouping

Command	Description
	User Defined Parameters
DA1	Select a1 = Ra as denominator for parameter being defined
DA2	Select a2 = Rb as denominator for parameter being defined
DB1	Select b1 = Ta as denominator for parameter being defined
DB2	Select b2 = Tb as denominator for parameter being defined
DE1	Select unity as denominator for parameter being defined
DEN?	Output denominator selection for parameter being defined
NA1	Select a1 as numerator for parameter being defined
NA2	Select a2 as numerator for parameter being defined
NB1	Select b1 as numerator for parameter being defined
NB2	Select b2 as numerator for parameter being defined
NU1	Select unity as numerator for parameter being defined
NUM?	Output numerator selection for parameter being defined
USL	Enter label string for user parameter being defined
USL?	Output label string for user parameter being defined
USR1	Measure user parameter 1 on active channel
USR2	Measure user parameter 2 on active channel
USR3	Measure user parameter 3 on active channel
USR4	Measure user parameter 4 on active channel

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Appendix C
360B Compatibility Information

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Appendix C
360B Compatibility Information

C-1 INTRODUCTION

This appendix provides GPIB compatibility information between the 37XXX family of Vector Network Analyzers and the 360B Vector Network Analyzers. The information is presented in the next several paragraphs and on a command by command basis in Table C-1.

The information presented here is useful when developing an application targeted to operate on both the 37XXX and 360B. It will also prove useful when updating existing 360B application programs.

C-2 GENERAL

The primary driving factor in the degree of compatibility between the two families is the fact that 37XXX remote operations conform to the IEEE 488.2-1992 GPIB Standard.

The second set of compatibility issues are those due to differences in design of like features, i.e. features that exist both on the 360B and the 37XXX. Please note that the majority of GPIB commands implementing these front panel functions and like measurement features on the two VNA families are identical both in syntax and functionality.

The third area of compatibility is the differences in the feature set, or measurement capabilities, implemented in the 360B vs. the 37XXX.

C-3 REMOTE OPERATIONS DIFFERENCES

The key differences between the 37XXX and the 360B VNA remote operation implementations are in GPIB communication and data transfer protocols, service request (SRQ) generation and status reporting, synchronization, and use of IEEE 488.2 common commands. A summary of the key differences is provided below.

Refer to Chapters 1, 2, 7, and the remainder of the 37XXX Programming Manual for details and examples of how the 37XXX implements the following items. Refer to the 360B Programming Manual for complete 360B details.

The remote operation differences are:

The terminator character for the 37XXX is the linefeed (LF) character. The 360B terminator is selectable, either the carriage return (CR) character only, or both the CR/LF.

The separator character, the semi-colon (;) character, for commands and multiple response messages is required for the 37XXX . The 360B optionally uses a space and/or the semi-colon for this separation. The comma (,) character is mandatory for separating multiple data elements of a single commands data response in the 37XXX. The 360B uses the comma and the LF as needed, but for the most part this behavior is the same between the two instrument families.

Suffix terminator mnemonics, i.e. GHZ, can optionally be used with 37XXX data entry commands to indicate a weight for the value entered or to provide clarity and readability of your program. The 360B requires the use of terminator codes.

Block data transfers on the 37XXX, whether ASCII or binary, typically require a header which has encoded in it the number of bytes to follow in the data string. This header is not always used in the same manner, and it differs from a similar header used by the 360B.

ASCII string delimiters can be single or double quotes (' ' or " ") on the 37XXX. The 360B only uses double quotes.

Single numeric data elements are only transmitted using ASCII representation on the 37XXX. The 360B uses ASCII or binary depending on the command. This mostly impacts status reporting commands that send and receive register, or byte, values.

Service Request (SRQ) and Status reporting structures and operation on the 37XXX are as defined by the IEEE 488.2 Standard. This includes implementation of the additional event status registers specific to 37XXX features. The 360B differs greatly in this area. The following paragraphs expand more on status reporting as it is used for synchronization and error reporting.

Reset, Self Test, Instrument Identification, and Group Execute Trigger functionality are also quite different from 360B operation. This is because the 37XXX implementation is as defined by the IEEE 488.2 Standard.

In addition to the IEEE 488.2 defined identification commands, the 37XXX implements the 360B **OID** command - Output Identification String, but uses commas to separate the data fields.

The ***TST?** - Self Test Query, defined by the IEEE 488.2 and implemented in the 37XXX, runs an extensive hands-off self test and outputs a "0" or a "1" to indicate pass or fail respectively. However, it also writes information about any failed tests to the non-volatile Service Log. The 360B implements the **TST** command which only outputs error codes. See paragraph C-4, Design Differences, Error Reporting, below for more details on the Service Log).

37XXX synchronization with an application program is well defined by the IEEE 488.2 Standard via the Output Queue and the Status Reporting Structures. Specifically, by use of the ***OPC** - Operation Complete common command, ***OPC?** - Operation Complete common query, and bit 4 (MAV - Message Available) in the Status Byte Register. The external controller time out setting is a factor if using the ***OPC?** and waiting for its output.

The 37XXX status structures also provide for other, more application specific, synchronization mechanisms to include bits 0 and 3 of the Extended Event Status Register, and bits 0-3 of the Limits Event Status Register.

360B synchronization with an application program is provided via using the ONP - Output Number of Points command and proper setting of the external controller time out value. This command is used on the 360B in basically the same manner as the ***OPC?** query is used on the 37XXX. It is placed at the end of a command string to force the application program to wait for its output before continuing execution.

The 360B status structures provided for other, application specific, synchronization to include bits 0, 1, and 7 of the Primary Status Byte.

C-4 DESIGN DIFFERENCES

A summary of the key differences in design of similar features between the 37XXX and the 360B VNA families is provided below. Refer to the appropriate chapters in the 37XXX and the 360B Programming Manual for complete details about the specific items described below.

Active Menu:
The 360B switched to the front panel menu currently being manipulated by a GPIB mnemonic. This does not occur on the 37XXX.

Number of Measurement Points:
The 360B supported a variable number of up to 501 measurement points in Maximum, 168 points in Normal, and 85 in Minimum. The actual number of points selected by each category varied depending on the currently defined sweep to include whether a discrete fill sweep is in place.

The 37XXX provides for selecting the specific desired number of data points: 51, 101, 201, 401, 801, or 1601. The number of points defined in a discrete fill sweep cannot be varied.

Single and Dual Graph Data Outputs:
The 37XXX will output (or input) only the displayed data values, i.e.. outputting a single graph data display such as magnitude will produce an array of magnitude data only. This behavior can be modified by using the **DPR1** - Set Data Pair Output Format command, to allow for developing a single data transfer procedure in your application program. As it was not measured, the value of the non-displayed data ele-

ment will be set to zero. Of course, if the actual measurement data pair is desired you simply select the desired dual graph type prior to measuring the DUT. This feature allows you to optimize application program development time and complexity vs. data transfer throughput if you only desire a single data set.

The 360B always measures and outputs complex data pairs even if currently sweeping and measuring a single graph type such as magnitude.

Error Reporting:
The 360B Error Structures save power-up self test messages and error messages currently displayed on the screen. The most recent 20 errors can be output via GPIB or viewed on the front panel display. These error structures are not saved on power down, i.e.. they are saved in normal volatile RAM.

Status bits 2-4 in the Primary Status Byte are set to indicate Syntax, Out of Range, and Action Not Possible GPIB errors. Status bits 0-2 in the Secondary Status Byte are set to indicate Disk, Power-up Self Test, and Hardware failures.

The 37XXX implements a non-volatile Service Log for storing all, non-operator, system errors and failure messages. It also saves, in volatile RAM, the last two GPIB errors in the GPIB Error Structures. The GPIB errors include those reported by the 360B plus all other GPIB errors to include Query (Data I/O), Device Specific, Execution, and Command errors.

The Service Log and the GPIB error structures contain the error code and message, time/date stamp, and useful information about the errors. The information includes the actual program string and the location of the specific mnemonic that produced the error, if applicable.

The errors in the Service Log and the last two GPIB errors in the Error Structures can be accessed via the GPIB and from the front panel.

NOTE

The Service Log also contains a record of the latest system errors or failures, and where necessary, a profile of internal system hardware and software settings at the time the error occurred. This is used by Service Engineers to quickly troubleshoot and restore a system to proper operation should it ever fail.

Status bits 2-5 in the Standard Event Status Register will be set to indicate one of four GPIB error conditions. There are not Status bits set as a result of non-GPIB error conditions, i.e.. Hardware failure, Self Test failure, or Disk failures as is the case with the 360B.

Instrument State Queries:
The 360B implements the **OCF** command which outputs the complete instrument setup string. This string can be parsed to retrieve many individual instrument setup parameters. The **OAP** command also supports to a limited degree the querying of the currently active parameter's value.

The 37XXX implements the **OCF** command but, unlike the 360B, it *does not* support parsing of the **OCF** output string. It also does not implement the **OAP** command.

Instead, the 37XXX implements a rich set of query commands for most of the system setup parameters. These commands typically take on the base setup parameter's syntax (or a very close resemblence if several commands are related to a particular setup) and adds a question mark (?) at the end of the command.

Calibration Type Selection:
The 360B Forward Only Transmission and Reflection Frequency Response calibrations (see 360B **CFR**,**CRL**) are now subsets of the 37XXX Reflection Only Port 1 Calibration (**CRF**) and the Transmission Frequency Response Forward Calibration (**CFT**).

C-5 FEATURE SET DIFFERENCES

This section provides a listing of major feature set differences between the 37XXX and the 360B VNA families.

Please note that any commands listed are only provided to help you find the general area of discussion in the appropriate 360B and 37XXX Programming Manuals. The commands listed, if any, are not the complete set implementing the specific feature. Refer to the appropriate Operations and Programming Manuals of the 37XXX and the 360B for complete details regarding a specific feature or command function of interest.

360B Features not supported on the 37XXX

Data Collection Mode (commands **TIB**, **CCD**, **CFD**, **CRD**, and **OCS**.)

User Parameter (Non S-parameter) Measurement Mode.

NOTE
The USx series commands were completely redefined on the 37XXX to support Segmented Limits.

Millimeter Wave, Noise Figure, and Pulse Test Sets and adC-on modules, and Test Set Multiplexer.

Port 1 Test Attenuator and Port 2 Source Attenuator.

Video In/Out Switching.

Set-on Receiver and Source Tracking Modes.

NOTE:
The commands for these modes have been redefined to support Diagnostic Modes on the 37XXX. Do not use these commands on the 37XXX.

37XXX Features Not Present on the 360B

The following features are not supported on the 360B:

- Segmented Limits.
- Limits Testing.
- Flexible Reverse Parameter Calibrations (S12, S22, and S12/S22.)
- Internal Hard Disk.
- Non-volatile memory Service Log.
- GPIB Error Reporting Structures.
- Peripheral Port (GPIB, Printer, External Keyboard) Testing.
- Additional Internal Memory State Save/Recall Registers (10 total.)
- Expanded Calibration Support to include Reverse S-parameters. Calibrations can now be done for forward, reverse, or both S-paramters in 8 different combinations.

C-6 37XXX/360B COMMANDS TABLE

Table C-1 alphabetically lists all 37XXX GPIB commands, the corresponding 360B commands (also in alphabetical order), the degree of compatibility between them, and related commands and remarks.

This table also serves as a guide to the 360B commands implemented on the 37XXX. If a desired 360B command is not listed in the table, then it is not implemented on the 37XXX.

The Compatibility Codes column in table C-1 references one of the three codes described below:

N
This code indictates a new command on the 37XXX. The command does not exist in the 360B command set.

S
This code indictates the same command exists on the 37XXX and the 360B. The command is identical both in syntax and function.

SM
This code indictates a command that has the same syntax as the 360B but has been modified in functionality on the 37XXX. The command is identical in syntax but its functionality, implementation, and/or behavior have been modified on the 37XXX from that of the 360B.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
*CLSF	Clear status bytes and structures	N		Same as CSB
*DDT	Enter the 488.2 Define Device Trigger command string	N		See 360B DEF,END
*DDT?	Output the 488.2 Define Device Trigger command string	N		
*ESE	Enter the 488.2 Standard Event Status Enable mask	N		
*ESE?	Output the 488.2 Standard Event Status Enable mask	N		
*ESR?	Output the 488.2 Standard Event Status Register value	N		
*IDN?	Output the 488.2 instrument identification string	N		
*IST?	Output the value of the ist message	N		
*OPC	Initiate the 488.2 Operation Complete sequence	N		
*OPC?	Initiate the 488.2 Operation Complete Query sequence	N		
*OPT?	Output the 488.2 options installed string	N		
*PRE	Enter the 488.2 Parallel Poll Register Enable mask	N		
*PRE?	Output the 488.2 Parallel Poll Register Enable mask	N		
*RST	Instrument reset	N		Same as RST
*SRE	Enter the 488.2 Service Request Enable mask	N		See IPM,IEM, and for 360B, also see: SQ1,SQ0
*SRE?	Output the 488.2 Service Request Enable mask	N		
*STB?	Output the 488.2 Status Byte value	N		See OPB
*TRG	Initiate a Group Execute Trigger sequence	N		
*TST?	Perform self test and output status	N		See TST
*WAI	Wait to continue	N		

•Command Compatibility Code Descriptions:
N = New command for the 37XXX.
S = Same command for both the 360B and the 37XXX.
SM = Same command for both the 360B and the 37XXX, but functionality or behavior is modified on the 37XXX.

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
A12	Simulate 12-term calibration	S	A12	
A8R	Simulate 1-path 2-port calibration reverse path	N		
A8T	Simulate 1-path 2-port calibration forward path	S	A8T	
ABT	Simulate trans freq response calibration forward and reverse	N		
ADD	Select addition as trace math for active channel	S	ADD	
ADDFC	Enter frequency counter GPIB address	N		
ADDFC?	Output frequency counter GPIB address	N		
ADDPLT	Enter plotter GPIB address	N		
ADDPLT?	Output plotter GPIB address	N		
ADDPM	Enter power meter GPIB address	N		
ADDPM?	Output power meter GPIB address	N		
ADPL	Enter electrical length for adapter removal	N		
ADPL?	Output electrical length for adapter removal	N		
ADRIVE	Select the floppy drive as the default drive	N		
AFT	Simulate transmission frequency response calibration forward path	S	AFT	
AH0	Turn automatic DUT protection off	N		
AH1	Turn automatic DUT protection on	N		
AHX?	Output automatic DUT protection on/off status	N		
ALC	Perform ALC loop internal calibration	N		
AMKR	Select active marker on all channels marker mode	N		
ANNCOL	Enter the color number for annotation and menu text	N		
ANNCOL?	Output the color number for annotation and menu text	N		
AOF	Turn averaging off	S	AOF	
AOF?	Output averaging on/off status	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
AON	Turn averaging on	N		See AVG
APR	Enter group delay aperture setting on active channel	S	APR	
APR?	Output group delay aperture setting on active channel	N		
ARB	Simulate reflection only calibration both ports	N		
ARF	Simulate reflection only calibration port 1	S	ARF	
ARR	Simulate reflection only calibration port 2	N		
ART	Simulate trans freq response calibration reverse path	N		
ASC	Autoscale the active channel display	S	ASC	
ASP	Enter polar stop sweep position angle	S	ASP	
ASP?	Output polar stop sweep position angle	N		
AST	Enter polar start sweep position angle	S	AST	
AST?	Output polar start sweep position angle	N		
ATTN	Attach next segment and make the active segment	N		
AVG	Enter averaging count and turn on	S	AVG	
AVG?	Output averaging count	N		
BBL	Select broadband load for calibration	S	BBL	
BBZ	Enter broadband load impedance for calibration	N		
BBZL	Enter broadband load inductance for calibration	N		
BC0	Turn CRT display off (disabled)	S	BC0	
BC1	Turn CRT display on (disabled)	S	BC1	
BCKCOL	Enter the color number for background	N		
BCKCOL?	Output the color number for background	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
BCX?	Output CRT display on/off status	N		
BD1	Select band 1 for definition	S	BD1	
BD2	Select band 2 for definition	S	BD2	
BD3	Select band 3 for definition	S	BD3	
BD4	Select band 4 for definition	S	BD4	
BD5	Select band 5 for definition	S	BD5	
BDMM	Define Millimeter Wave band equations	N		
BEEP0	Disable the instrument beeper on GPIB errors	N		
BEEP1	Enable the instrument beeper on GPIB errors	N		
BEEPX?	Output GPIB beep on error enable/disable status	N		
BEG	Begin taking calibration data	SM	BEG	t 0 on 37XXX Extended Event Status Register
BEGN	Begin next segment and make it the active segment	N		
BH0	Turn bias off while in hold	S	BH0	
BH1	Turn bias on while in hold	S	BH1	
BHX?	Output bias on/off during hold status	N		
BMPB	Select Black on White as bitmap type	N		
BMPC	Select Color on White as bitmap type	N		
BMPT	Select true color as bitmap type	N		
BPF	Enter break point frequency for 3 line LRL calibration	S	BPF	
BSP	Enter band stop frequency	S	BSP	
BSP?	Output band stop frequency	N		
BST	Enter band start frequency	S	BST	
BST?	Output band start frequency	N		
BWL3	Set bandwidth loss value to 3 dB	N		
BWLS	Enter bandwidth loss value	N		
BWLS?	Output bandwidth loss value	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
C12	Select 12 term calibration	S	C12	
C8R	Select 1-path 2-port calibration reverse path	N		
C8T	Select 1-path 2-port calibration forward path	S	C8T	
CALR	Perform receiver cal for gain compression testing	N		
CAS	Clear active segmented limit vertical/horizontal definitions	N		
CBT	Select trans freq response calibration forward and reverse	N		
CC0	Enter capacitance coefficient 0 for open	S	CC0	
CC1	Enter capacitance coefficient 1 for open	S	CC1	
CC2	Enter capacitance coefficient 2 for open	S	CC2	
CC3	Enter capacitance coefficient 3 for open	S	CC3	
CCD	Collect corrected data in an internal buffer	SM	CCD	0 data points. Data collection does not commence until the DCCTN command has been given.
CD	Change default directory	N		
CDRIVE	Select the hard disk as the default drive	N		
CF2	Select female 2.4mm connector for current port	S	CF2	
CF3	Select female GPC-3.5 connector for current port	S	CF3	
CFC	Select female TNC connector for current port	S	CFC	
CFD	Collect final data in an internal buffer	SM	CFD	Can collect 20,000 data points. Collection does not commence until the DCCTN command has been given.
CFK	Select female K connector for current port	S	CFK	
CFN	Select female Type N connector for current port	S	CFN	
CFN75	Select Female type N 75-ohm connector for current port	N		
CFS	Select female SMA connector for current port	S	CFS	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
CFSP	Select Special Female connector for current port	N		
CFT	Select trans freq response calibration forward path	S	CFT	
CFV	Select female V connector for current port	S	CFV	
CH1	Make channel 1 the active channel	S	CH1	
CH2	Make channel 2 the active channel	S	CH2	
CH3	Make channel 3 the active channel	S	CH3	
CH4	Make channel 4 the active channel	S	CH4	
CHX?	Output active channel number	N		
CL0	Enter inductive coefficient 0 for short	N		
CL1	Enter inductive coefficient 1 for short	N		
CL2	Enter inductive coefficient 2 for short	N		
CL3	Enter inductive coefficient 3 for short	N		
CLB	Clear all multiple source band definitions	S	CLB	
CLBMM	Clear the new Millimeter Wave band definitions	N		
CM	Suffix sets distance data type and scales by 1E-2	N		Same as CMT
CM2	Select male 2.4mm connector for current port	S	CM2	
CM3	Select male GPC-3.5 connector for current port	S	CM3	
CMC	Select male TNC connector for current port	S	CMC	
CMK	Select male K connector for current port	S	CMK	
CMN	Select male N connector for current port	S	CMN	
CMN75	Select Male type N 75-Ohm connector for current port	N		
CMS	Select male SMA connector for current port	S	CMS	

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
CMSP	Select Special Male connector for current port	N		
CMT	Suffix sets distance data type and scales by 1E-2	S	CMT	
CMV	Select male V connector for current port	S	CMV	
CMX?	Output calibration method	N		
CND	Select user specified connector for current port	S	CND	
CNG	Select GPC-7 connector for current port	S	CNG	
CNTR	Enter center frequency	N		
CNTR?	Output center frequency	N		
COF	Turn error correction off	S	COF	
CON	Turn error correction on	S	CON	
CON?	Output error correction on/off status	N		
COO	Enter offset for open for user specified connector	S	COO	
COPY	Copy a files contents to another file	N		
COS	Enter offset for short for user specified connector	S	COS	
CRB	Select reflection only calibration both ports	N		
CRD	Collect raw data in an internal buffer	SM	CRD	Can collect 20,000 data points. Data collection does not commence until the DCCTN command has been given.
CRF	Select reflection only calibration port 1	S	CRF	
CRR	Select reflection only calibration port 2	N		
CRT	Select trans freq response calibration reverse path	N		
CSB	Clear status bytes and structures (same as *CLS)	S	CSB	
CSF?	Output cal start frequency	N		
CSL	Clear service log	N		
CTF?	Output cal stop frequency	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
CTN	Continue sweeping from current point	S	CTN	
CWC	Select CW frequency calibration data points	S	CWC	
CWD?	Output current working directory string	N		
CWF	Enter CW frequency and turn CW on	S	CWF	
CWF?	Output CW frequency	N		
CWON	Turn CW on at current CW frequency	N		See CWF
CWON?	Output CW on/off status	N		
CWP	Enter number of points drawn in CW	S	CWP	
CWP?	Output number of points drawn in CW	N		
CXD?	Output internal buffer data collection mode	N		
CXX?	Output calibration type	N		
D13	Display channels 1 & 3	S	D13	
D14	Display all four channels	S	D14	
D24	Select dual channel display with channels 2 & 4	S	D24	
DA1	Select a1 = Ra as denominator for parameter being defined	N		
DA2	Select a2 = Rb as denominator for parameter being defined	N		
DAT	Display data only on active channel	S	DAT	
DAT?	Output trace memory display mode	N		
DATCOL	Enter the color number for data	N		
DATCOL?	Output the color number for data	N		
DATE	Enter the system date	N		
DATE?	Output the system date	N		
DB	Suffix sets power data type	N		Same as DBL
DB1	Select b1 = Ta as denominator for parameter being defined	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
DB2	Select b2 = Tb as denominator for parameter being defined	N		
DBL	Suffix sets power data type	S	DBL	
DBM	Suffix sets power data type	S	DBM	
DBP	Select distance bandpass mode for active channel	S	DBP	
DC1	Display channel 1 and 2 operating parameters	S	DC1	
DC3	Display channel 3 and 4 operating parameters	S	DC3	
DCA	Select automatic DC term calculation for lowpass	S	DCA	
DCCTN	Resume internal buffer data collection	N		
DCCTN?	Output internal buffer data collection resume/suspend status	N		
DCHLD	Suspend internal buffer data collection	N		
DCMRK	Inserts the mark value into the internal buffer	N		
DCO	Select open for DC term for lowpass	S	DCO	
DCOFF	Turn internal buffer data collection mode off	N		
DCP	Display calibration parameters 1st page	S	DCP	
DCP1	Display calibration parameters 1st page	N		Same as DCP
DCP2	Display calibration parameters 2nd page	N		
DCS	Select short for DC term for lowpass	S	DCS	
DCV	Enter value for DC term for lowpass	S	DCV	
DCV?	Output lowpass DC term value	N		
DCX?	Output lowpass DC term selection	N		
DCZ	Select line impedance for DC term for lowpass	S	DCZ	
DD0	Turn data drawing off	S	DD0	
DD1	Turn data drawing on	S	DD1	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
DD1?	Output data drawing on/off status	N		
DDX?	Output active channel domain parameter frequency distance or time	N		
DE1	Select unity as denominator for parameter being defined	N		
DEG	Suffix sets phase data type	S	DEG	
DEL	Delete a file from disk	N		
DEN?	Output denominator selection for parameter being defined	N		
DF2	Display 2.4mm female connector information	S	DF2	
DF3	Display GPC-3.5 female connector information	S	DF3	
DFC	Select discrete frequency calibration data points	S	DFC	
DFD	Done specifying discrete frequency ranges	S	DFD	
DFK	Display K female connector information	S	DFK	
DFN	Display N female connector information	S	DFN	
DFN75	Display N Female 75-Ohm connector information	N		
DFP	Display Front panel instrument state	S	DFP	
DFQ	Enter single discrete frequency	S	DFQ	
DFS	Display SMA female connector information	S	DFS	
DFSP	Display Special Female connector information	N		
DFT	Display TNC female connector information	S	DFT	
DFV	Display V female connector information	S	DFV	
DG7	Display GPC-7 Male connector information	S	DG7	
DGS	Display GPIB status information	S	DGS	
DGT	Display 1st CRT test pattern	N		
DGT1	Display 1st CRT test pattern	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
DGT2	Display 2nd CRT test pattern	N		
DGT3	Display 3rd CRT test pattern	N		
DIA	Select air as active dielectric	S	DIA	
DIE	Enter a dielectric value	S	DIE	
DIM	Select microporous teflon as active dielectric	S	DIM	
DIP	Select polyethylene as active dielectric	S	DIP	
DIR	Output a directory listing to the GPIB	N		
DIS	Display active segmented limit	N		
DIS?	Output active segmented limit on/off status	N		
DISKRD	Output disk file data to the GPIB	N		
DISKWR	Write GPIB data to a disk file	N		
DIT	Select Teflon as active dielectric	S	DIT	
DIV	Select division as trace math for active channel	S	DIV	
DIX?	Output dielectric constant	N		
DLA	Select group delay display for active channel	S	DLA	
DLP	Select distance lowpass mode for active channel	S	DLP	
DM2	Display 2.4mm male connector information	S	DM2	
DM3	Display GPC-3.5 male connector information	S	DM3	
DMK	Display K male connector information	S	DMK	
DMN	Display N male connector information	S	DMN	
DMN75	Display N Male 75-Ohm connector information	N		
DMS	Display SMA male connector information	S	DMS	
DMSP	Display Special Male connector information	N		
DMT	Display TNC male connector information	S	DMT	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
DMV	Display V male connector information	S	DMV	
DNM	Display data normalized to trace memory on active channel	N		
DPI	Select distance phasor impulse mode for active channel	S	DPI	
DPN	Enter pen number for data	S	DPN	
DPR0	Visible data only OFD format	N		
DPR1	Data pair always OFD format	N		
DPRX?	Output data pair mode visible only or pair always	N		
DR1	Select Marker 1 as Delta Reference Marker	S	DR1	
DR2	Select Marker 2 as Delta Reference Marker	S	DR2	
DR3	Select Marker 3 as Delta Reference Marker	S	DR3	
DR4	Select Marker 4 as Delta Reference Marker	S	DR4	
DR5	Select Marker 5 as Delta Reference Marker	S	DR5	
DR6	Select Marker 6 as Delta Reference Marker	S	DR6	
DRF	Turn delta reference mode on	S	DRF	
DRL	Diagnostic read latch	N		
DRO	Turn delta reference mode off	S	DRO	
DRO?	Output delta reference mode on/off status	N		
DRX?	Output delta reference marker number	N		
DSF0	Disable filter shape factor calculation	N		
DSF1	Enable filter shape factor calculation	N		
DSFX?	Output filter shape factor calculation enable/disable status	N		
DSP	Select single channel display	S	DSP	
DSP?	Output channel display mode	N		
DSQ0	Disable filter Q calculation	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
DSQ1	Enable filter Q calculation	N		
DSQX?	Output filter Q calculation enable/disable status	N		
DTM	Display measurement data and trace memory on active channel	S	DTM	
DVM	Enter DVM channel number	N		
DWG	Display waveguide parameters	S	DWG	
DWL	Diagnostic write latch	N		
E12	Set Millimeter Wave band to E band (WR-12)	N		
E12E	Set Millimeter Wave band to E band (WR-12)	N		
ECW	Select CW operation for component being edited	S	ECW	
ED1	Edit source 1 equation	S	ED1	
ED2	Edit source 2 equation	S	ED2	
EDG	End diagnostics mode	N		
EDR	Edit receiver equation	S	EDR	
EDV	Enter divisor value for equation being edited	S	EDV	
EDV?	Output divisor value for equation being edited	N		
EKT	Select external keyboard testing	N		
EML	Enter multiplier value for equation being edited	S	EML	
EML?	Output multiplier value for equation being edited	N		
EOS	Enter offset frequency for equation being edited	S	EOS	
EOS?	Output offset frequency for equation being edited	N		
ESW	Select sweep operation for component being edited	S	ESW	
EXD	Display external A/D input	N		
EXISTD?	Output directory existence information	N		
EXISTF?	Output file existence information	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
EXW?	Output multiple source sweep flag for equation being edited	N		
FCW0	Turn fast CW measurement mode off	N		
FCW1	Turn fast CW measurement mode on	N		
FCW2	Turn Fast CW mode 2 on	N		
FCWX?	Output fast CW measurement mode on/off status	N		
FDH0	Select variable length arbitrary block headers	N		
FDH1	Select fixed length arbitrary block headers	N		
FDH2	Select zero length arbitrary block headers	N		
FDHX?	Output arbitrary block header length selection	N		
FFD	Send form feed to printer and stop print/plot	S	FFD	
FGT	Select frequency with time gate for active channel	S	FGT	
FHI	Set data points to 1601	SM	FHI	1601 on 37XXX, up to 501 on 37XXX. Not valid during discrete fill on 37XXX
FIL	Fill defined discrete frequency range	S	FIL	
FLC	Source frequency linearity internal calibration	N		
FLO	Set data points to 101	SM	FLO	101 on 37XXX, up to 501 on 37XXX. Not valid during discrete fill on 37XXX
FLTBW?	Output filter bandwidth	N		
FLTC?	Output filter center frequency	N		
FLTL?	Output filter loss at reference value	N		
FLTQ?	Output filter Q	N		
FLTS?	Output filter shape factor	N		
FMA	Select ASCII data transfer format	S	FMA	
FMB	Select IEEE754 64 bit data transfer format	S	FMB	

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
FMC	Select IEEE754 32 bit data transfer format	S	FMC	
FME	Set data points to 401	SM	FME	401 on 37XXX, up to 501 on 37XXX. Not valid during discrete fill on 37XXX
FMKR	Select filter parameters marker mode	N		
FMT0	Select normal ascii data element delimiting	N		
FMT1	Select enhanced ascii data element delimiting	N		
FMTX?	Output ascii data element delimiting mode	N		
FMX?	Output data output mode FMA FMB or FMC	N		
FOF	Blank frequency information	S	FOF	
FON	Display frequency information	S	FON	
FOX?	Output frequency information on/off status	N		
FP0	Turn flat power correction off	S	FP0	
FP1	Turn flat power correction on	S	FP1	
FPT	Select front panel keypad testing	N		
FPX?	Output flat power correction on/off status	N		
FQD	Select frequency domain for active channel	S	FQD	
FRC	Clear all defined discrete frequency ranges	S	FRC	
FRI	Enter Discrete Fill increment frequency	S	FRI	
FRP	Enter Discrete Fill number of points	S	FRP	
FRS	Enter Discrete Fill start frequency	S	FRS	
GCMP	Enter gain compression point search value	N		
GCMP?	Output gain compression point search value	N		
GCT	Enter gate center value distance or time	S	GCT	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
GCT?	Output gate center value	N		
GDS	Gate symbols displayed on active channel	S	GDS	
GHZ	Suffix sets frequency data type and scales by 1E9	S	GHZ	
GLS	Select low sidelobe gate shape	S	GLS	
GMS	Select minimum sidelobe gate shape	S	GMS	
GNM	Select nominal gate shape	S	GNM	
GOF	Turn off gating on active channel	S	GOF	
GOF?	Output gating mode on active channel	N		
GON	Turn on gating on active channel	S	GON	
GPN	Enter pen number for graticule	S	GPN	
GRF?	Output graph type for active channel	N		
GRT	Select Rectangular gate shape	S	GRT	
GRTCOL	Enter the color number for the graticule	N		
GRTCOL?	Output the color number for the graticule	N		
GSN	Enter gate span value distance or time	S	GSN	
GSN?	Output gate span value	N		
GSP	Enter gate stop value distance or time	S	GSP	
GSP?	Output gate stop value	N		
GST	Enter gate start value distance or time	S	GST	
GST?	Output gate start value	N		
GSX?	Output gate shape	N		
HC0	Disable internal IF calibration	S	HC0	
HC1	Enable internal IF calibration and trigger an IF calibration	S	HC1	
HCT	Trigger an IF calibration	N		See HC1
HCX?	Output internal IF calibration enable/disable status	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
HD0	Turn off tabular data headers and page formatting	S	HD0	
HD1	Turn on tabular data headers and page formatting	S	HD1	
HID	Hide active segmented limit	N		
HLD	Put sweep into hold mode	S	HLD	
HLD?	Output the sweep hold status	N		
HPN	Enter pen number for header	S	HPN	
HZ	Suffix sets frequency data type	N		
IARF	Enter adapter removal files from GPIB and calibrate	N		
IC1	Enter calibration coefficient 1	SM	IC1	Header is different and also used in FMA mode on 37XXX
IC10	Enter calibration coefficient 10	N		Same as ICA
IC11	Enter calibration coefficient 11	N	IC11	Same as ICB
IC12	Enter calibration coefficient 12	N	IC12	Same as ICC
IC2	Input Calibration Coefficient 2	SM	IC1	Header is different and also used in FMA mode on 37XXX
IC3	Enter calibration coefficient 3	SM	IC3	Header is different and also used in FMA mode on 37XXX
IC4	Enter calibration coefficient 4	SM	IC4	Header is different and also used in FMA mode on 37XXX
IC5	Enter calibration coefficient 5	SM	IC5	Header is different and also used in FMA mode on 37XXX
IC6	Enter calibration coefficient 6	SM	IC6	Header is different and also used in FMA mode on 37XXX
IC7	Enter calibration coefficient 7	SM	IC7	Header is different and also used in FMA mode on 37XXX
IC8	Enter calibration coefficient 8	SM	IC8	Header is different and also used in FMA mode on 37XXX
IC9	Enter calibration coefficient 9	SM	IC9	Header is different and also used in FMA mode on 37XXX
ICA	Enter calibration coefficient 10	SM	ICA	Header is different and also used in FMA mode on 37XXX
ICB	Enter calibration coefficient 11	SM	ICB	Header is different and also used in FMA mode on 37XXX
ICC	Enter calibration coefficient 12	SM	ICC	Header is different and also used in FMA mode on 37XXX

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
ICD	Enter corrected data for active channel parameter	SM	ICD	Header is different and also used in FMA mode on 37XXX
ICF	Enter front panel setup and calibration data	SM	ICF	Header is different on 37XXX
ICL	Enter all applicable calibration coefficients for cal type	SM	ICL	Header is different and also used in FMA mode on 37XXX
IEM	Enter extended status byte mask	SM	IEM	Uses an ASCII integer and Extended Byte is redefined on 37XXX
IF1	Select 10 Hz IF bandwidth	N		Same as: IFM on 37XXX
IF2	Select 100 Hz IF bandwidth	N		Same as: IFR on 37XXX, IFM on 360B
IF3	Select 1 KHz IF bandwidth	N		Same as: IFN on 37XXX, IFR on 360B
IF4	Select 10 KHz IF bandwidth	N		Same as: IFA on 37XXX, IFN on 360B
IFA	Select 30 KHz IF bandwidth	N		
IFB	Select 1st IF bandpass testing	N		
IFD	Enter final data for active channel parameter	SM	IFD	37XXX: Header is different and also used in FMA mode. Inputs single values in single graph displays
IFM	Select 10 Hz IF bandwidth	SM	IFM	Sets 10 HZ on 37XXX, 100 HZ on 360B
IFN	Select 1 KHz IF bandwidth	SM	IFN	Sets 1 KHZ IFBW on 37XXX, 10 KHZ on 360B
IFP	Enter current front panel setup	SM	IFP	Header is different on 37XXX
IFR	Select 100 Hz IF bandwidth	SM	IFR	Sets 100 HZ IFBW on 37XXX, 1 KHZ on 360B
IFV	Enter frequency values	SM	IFV	Header is different and also used in FMA mode on 37XXX
IFX?	Output IF bandwidth	N		
IHDW	Enter hardware cal data from GPIB	N		
IKIT	Enter calkit data from GPIB	N		
ILM	Enter limits status byte mask	N		
IMG	Select imaginary display for active channel	S	IMG	
IMU	Suffix sets imaginary data type	S	IMU	
INRM	Enter normalization data from GPIB	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
INT	Initialize (format) floppy disk	S	INT	
IPM	Enter the 488.2 Service Request Enable mask	S	IPM	
IS1	Enter front panel setup 1	SM	IS1	Uses an ASCII integer and Primary Byte is redefined on 37XXX
IS10	Enter front panel setup 10	N		
IS2	Enter front panel setup 2	SM	IS2	Uses an ASCII integer and Primary Byte is redefined on 37XXX
IS3	Enter front panel setup 3	SM	IS3	Uses an ASCII integer and Primary Byte is redefined on 37XXX
IS4	Enter front panel setup 4	SM	IS4	Uses an ASCII integer and Primary Byte is redefined on 37XXX
IS5	Enter front panel setup 5	N		
IS6	Enter front panel setup 6	N		
IS7	Enter front panel setup 7	N		
IS8	Enter front panel setup 8	N		
IS9	Enter front panel setup 9	N		
ISC	Enter scale and select inverted compressed Smith Chart display	S	ISC	
ISE	Enter scale and select inverted expanded Smith Chart display	S	ISE	
ISF	Exclude isolation	S	ISF	
ISM	Select normal inverted Smith Chart for active channel	S	ISM	
ISN	Include isolation	S	ISN	
KEC	Keep existing calibration data	S	KEC	
KHZ	Suffix sets frequency data type and scales by 1E3	S	KHZ	
L1C	Perform LO1 internal calibration	N		
L2C	Perform LO2 internal calibration	N		
LA1	Select a1 = Ra as phase lock for parameter being defined	S		
LA2	Select a2 = Rb as phase lock for parameter being defined	S		
LAND	Select landscape mode for output plot	N		
LAX?	Output phase lock selection for parameter being defined	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
LAYCOL	Enter the color number for overlay data	N		
LAYCOL?	Output the color number for overlay data	N		
LB0	Turn limits testing beep on failure off	N		
LB1	Turn limits testing beep on failure on	N		
LBX?	Output limits testing beeper enable status	N		
LCM	Select LRL calibration method	S	LCM	
LDARF	Load adapter removal files from disk and calibrate	N		
LDT0	Disable printing date/time	N		
LDT1	Enable printing date/time	N		
LFD	Enter limit frequency readout delta value	S	LFD	
LFD2	Enter limit frequency readout delta value for bottom graph	N		
LFD2?	Output limit frequency readout delta value for bottom graph	N		
LFD?	Output limit frequency readout delta value	N		
LFP	Select limit frequency readout for phase displays	S	LFP	
LFR	Select limit frequency readout for active channel	S	LFR	
LID	Enter string for DUT identity	SM	LID	Up to 15 characters on 37XXX
LID?	Output string for DUT identity	N		
LIN	Select linear magnitude display for active channel	S	LIN	
LKS0	Disable lock search mode	N		
LKS1	Enable lock search mode	N		
LKT	Load calibration kit information from floppy disk	S	LKT	
LL1	Enter length of line 1 for LRL calibration	S	LL1	
LL2	Enter length of line 2 for LRL calibration	S	LL2	

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
LL3	Enter length of line 3 for LRL calibration	S	LL3	
LLM?	Output limit line display mode single or segmented	N		
LLO	Enter lower limit value for top graph on active channel	S	LLO	
LLO2	Enter lower limit value for bottom graph on active channel	N		
LLO2?	Output lower limit value for bottom graph on active channel	N		
LLO?	Output lower limit value for top graph on active channel	N		
LLZ	Enter line impedance for LRL calibration	S	LLZ	
LM2	Select a match for the second device during a LRM type calibration	S	LM2	
LM3	Select a match for the third device during a LRM type calibration	S	LM3	
LMS	Enter string for DUT model/serial number	SM	LMS	Up to 15 characters on 37XXX
LMS?	Output string for DUT model/serial number	N		
LNM	Enter string for operator name	SM	LNM	Up to 15 characters on 37XXX
LNM?	Output string for operator name	N		
LO11	Select LO1 phase lock voltage testing	N		
LO12	Select LO1 D/A voltage testing	N		
LO21	Select LO2 main phase lock voltage testing	N		
LO22	Select LO2 offset phase lock voltage testing	N		
LO23	Select LO2 DDS phase lock voltage testing	N		
LO24	Select LO2 main D/A voltage testing	N		
LO25	Select LO2 offset D/A voltage testing	N		
LOC	Enter string for operator comment	N		
LOC?	Output string for operator comment	N		

- Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
LOF	Limits display off	S	LOF	
LOGO0	Turn hard copy logo off	N		
LOGO1	Turn hard copy logo on	N		
LOGO?	Output hard copy logo selection standard/user defined	N		
LOGOS	Select standard hard copy logo	N		
LOGOU	Select user defined hard copy logo	N		
LOGOX?	Output hard copy logo on/off status	N		
LOL0	Turn lower limit off	N		
LOL1	Turn lower limit on at current value	N		
LOL20	Turn lower limit off for bottom graph	N		
LOL21	Turn lower limit on at current value for bottom graph	N		
LOL2X?	Output lower limit on/off status for bottom graph	N		
LOLX?	Output lower limit on/off status	N		
LON	Limits display on	S	LON	
LON?	Output limits display on/off status	N		
LPF1?	Output limit test failure status on channel 1	N		
LPF2?	Output limit test failure status on channel 2	N		
LPF3?	Output limit test failure status on channel 3	N		
LPF4?	Output limit test failure status on channel 4	N		
LPF?	Output limit test failure status all channels	N		
LPH	Select linear magnitude and phase display for active channel	S	LPH	
LPI	Select lowpass impulse response for active channel	S	LPI	
LPS	Select lowpass step response for active channel	S	LPS	
LPSX?	Output lowpass response for active channel impulse or step	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
LR2	Specify 2 line LRL calibration	S	LR2	
LR3	Specify 3 line LRL calibration	S	LR3	
LS1	Set lower segmented limit 100 as the active segment	N		
LS10	Select lower segmented limit 10 as the active segment	N		
LS2	Select lower segmented limit 2 as the active segment	N		
LS3	Select lower segmented limit 3 as the active segment	N		
LS4	Select lower segmented limit 4 as the active segment	N		
LS5	Select lower segmented limit 5 as the active segment	N		
LS6	Select lower segmented limit 6 as the active segment	N		
LS7	Select lower segmented limit 7 as the active segment	N		
LS8	Select lower segmented limit 8 as the active segment	N		
LS9	Select lower segmented limit 9 as the active segment	N		
LSB	Select least significant byte first binary transfer	SM	LSB	Default binary mode for 360B, MSB is default for 37XXX
LSEG	Select segmented limit line display mode	N		
LSNG	Select single limit line display mode	N		
LSX?	Output active segmented limit	N		
LT0	Turn limits testing off	N		
LT1	Turn limits testing on	N		
LT1?	Output limits testing enable status	N		
LTC	Select coaxial transmission line for calibration	S	LTC	
LTST	Display the limits testing menu	N		
LTU	Select microstrip transmission line for calibration	S	LTU	
LTW	Select waveguide transmission line for calibration	S	LTW	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
LTX?	Output line type	N		
LUP	Enter upper limit value for top graph on active channel	S	LUP	
LUP2	Enter upper limit value for bottom graph on active channel	N		
LUP2?	Output upper limit value for bottom graph on active channel	N		
LUP?	Output upper limit value for top graph on active channel	N		
LVH	Select high as limits testing TTL level	N		
LVL	Select low as limits testing TTL level	N		
LVX?	Output limits testing ttl level status	N		
M	Suffix sets distance data type	N		Same as MTR
M1C	Set CW mode at marker 1 frequency	S	M1C	
M1E	Set sweep/zoom end to marker 1 frequency distance or time	S	M1E	
M1S	Set sweep/zoom start to marker 1 frequency distance or time	S	M1S	
M2C	Set CW mode at marker 2 frequency	S	M2C	
M2E	Set sweep/zoom end to marker 2 frequency distance or time	S	M2E	
M2S	Set sweep/zoom start to marker 2 frequency distance or time	S	M2S	
M3C	Set CW mode at marker 3 frequency	S	M3C	
M3E	Set sweep/zoom end to marker 3 frequency distance or time	S	M3E	
M3S	Set sweep/zoom start to marker 3 frequency distance or time	S	M3S	
M4C	Set CW mode at marker 4 frequency	S	M4C	
M4E	Set sweep/zoom end to marker 4 frequency distance or time	S	M4E	
M4S	Set sweep/zoom start to marker 4 frequency distance or time	S	M4S	
M5C	Set CW mode at marker 5 frequency	S	M5C	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
M5E	Set sweep/zoom end to marker 5 frequency distance or time	S	M5E	
M5S	Set sweep/zoom start to marker 5 frequency distance or time	S	M5S	
M6C	Set CW mode at marker 6 frequency	S	M6C	
M6E	Set sweep/zoom end to marker 6 frequency distance or time	S	M6E	
M6S	Set sweep/zoom start to marker 6 frequency distance or time	S	M6S	
MAG	Select log magnitude display for active channel	S	MAG	
MAT	Select matched reflective devices during cal	S	MAT	
MD	Create a new disk directory	N		
MEM	Display trace memory on active channel	S	MEM	
MFGCT	Start multiple frequency swept power gain compression test	N		
MHZ	Suffix sets frequency data type and scales by 1E6	S	MHZ	
MIN	Select subtraction as trace math for active channel	S	MIN	
MIX	Select mixed reflective devices during calibration	S	MIX	
MK1	Enter marker 1 frequency distance or time and turn on	S	MK1	
MK1?	Output marker 1 frequency distance or time	N		
MK2	Enter marker 2 frequency distance or time and turn on	S	MK2	
MK2?	Output marker 2 frequency distance or time	N		
MK3	Enter marker 3 frequency distance or time and turn on	S	MK3	
MK3?	Output marker 3 frequency distance or time	N		
MK4	Enter marker 4 frequency distance or time and turn on	S	MK4	
MK4?	Output marker 4 frequency distance or time	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
MK5	Enter marker 5 frequency distance or time and turn on	S	MK5	
MK5?	Output marker 5 frequency distance or time	N		
MK6	Enter marker 6 frequency distance or time and turn on	S	MK6	
MK6?	Output marker 6 frequency distance or time	N		
MKRC	Select interpolated marker functionality	N		
MKRCOL	Enter the color number for the markers	N		
MKRCOL?	Output the color number for the markers	N		
MKRD	Select discrete marker functionality	N		
MKRX?	Output interpolated/discrete marker functionality	N		
MKSL	Marker search left	N		
MKSR	Marker search right	N		
MKT0	Turn marker tracking off	N		
MKT1	Turn marker tracking on	N		
MKTX?	Output marker tracking on/off status	N		
MM	Suffix sets distance data type and scales by 1E-3	N		
MMBX?	Output Millimeter Wave band selection	N		
MMN	Move active marker to minimum trace value	S	MMN	
MMT	Suffix sets distance data type and scales by 1E-3	S	MMT	
MMX	Move active marker to maximum trace value	S	MMX	
MNUCOL	Enter the color number for the menu headers	N		
MNUCOL?	Output the color number for the menu headers	N		
MO1	Turn off marker 1	S	MO1	
MO2	Turn off marker 2	S	MO2	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
MO3	Turn off marker 3	S	MO3	
MO4	Turn off marker 4	S	MO4	
MO5	Turn off marker 5	S	MO5	
MO6	Turn off marker 6	S	MO6	
MOF	Turn marker display off	S	MOF	
MON	Turn marker display on	S	MON	
MON?	Output marker display on/off status	N		
MPH	Select log magnitude and phase display for active channel	S	MPH	
MPN	Enter pen number for markers and limits	S	MPN	
MR1	Turn marker 1 on and make it the active marker	S	MR1	
MR1?	Output marker 1 on/off status	N		
MR2	Turn marker 2 on and make it the active marker	S	MR2	
MR2?	Output marker 2 on/off status	N		
MR3	Turn marker 3 on and make it the active marker	S	MR3	
MR3?	Output marker 3 on/off status	N		
MR4	Turn marker 4 on and make it the active marker	S	MR4	
MR4?	Output marker 4 on/off status	N		
MR5	Turn marker 5 on and make it the active marker	S	MR5	
MR5?	Output marker 5 on/off status	N		
MR6	Turn marker 6 on and make it the active marker	S	MR6	
MR6?	Output marker 6 on/off status	N		
MRM	Display the Marker Readout menu	N		
MRR	Restore original marker range	S	MRR	
MRX?	Output active marker number	N		
MS	Suffix sets time data type and scales by 1E-3	N		
MS0	Turn multiple source mode off	S	MS0	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
MS1	Turn multiple source mode on	S	MS1	
MSB	Select most significant byte first binary transfer	S	MSB	
MSD	Select multiple source define mode	S	MSD	
MSFH	Enter high loss value for shape factor calculation	N		
MSFH?	Output high loss value for shape factor calculation	N		
MSFL	Enter low loss value for shape factor calculation	N		
MSFL?	Output low loss value for shape factor calculation	N		
MSR0	Select 0 as reference for marker search and bandwidth calculation	N		
MSRD	Select delta reference marker as reference for marker search and bandwidth calculation	N		
MSRM	Select maximum as reference for marker search and bandwidth calculation	N		
MSRX?	Output reference selection for marker search and bandwidth calculation	N		
MSX?	Output multiple source mode on/off/define	N		
MTH?	Output trace math math type	N		
MTR	Suffix sets distance data type	S	MTR	
MUL	Select multiplication as trace math for active channel	S	MUL	
MV	Suffix sets voltage data type and scales by 1E-3	N		
NA1	Select a1 as numerator for parameter being defined	N		
NA2	Select a2 as numerator for parameter being defined	N		
NB1	Select b1 as numerator for parameter being defined	N		
NB2	Select b2 as numerator for parameter being defined	N		
NCS	Go to next calibration step	S	NCS	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
NMKR	Select normal markers on active channel marker mode	N		
NOC	Select normal calibration data points	S	NOC	
NOFST	Enter nominal offset value for external gain	N		
NOFST?	Output nominal offset value for external gain	N		
NP101	Set data points to 101	N		
NP1601	Set data points to 1601	N		
NP201	Set data points to 201	N		
NP401	Set data points to 401	N		
NP51	Set data points to 51	N		
NP801	Set data points to 801	N		
NRD	Display non-ratioed parameters on 4 channels	SM	NRD	Diagnostics Mode use only on 37XXX. Do not use for measurements.
NRMS	Normalize S21 for gain compression testing	N		
NS	Suffix sets time data type and scales by 1E-9	N		
NSC	Suffix sets time data type and scales by 1E-9	N		
NU1	Select unity as numerator for parameter being defined	N		
NUM?	Output numerator selection for parameter being defined	N		
OAM1	Output channel 1 active marker value	N		
OAM2	Output channel 2 active marker value	N		
OAM3	Output channel 3 active marker value	N		
OAM4	Output channel 4 active marker value	N		
OBMP	Output the display as a bitmap	N		
OC1	Output calibration coefficients 1	SM	OC1	Data header is different and the header is also used in FMA mode on 37XXX

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
OC10	Output calibration coefficients 10	N		Same as OCA
OC11	Output calibration coefficients 11	N		Same as OCB
OC12	Output calibration coefficients 12	N		Same as OCC
OC2	Output calibration coefficients 2	SM	OC2	Data header is different and the header is also used in FMA mode on 37XXX
OC3	Output calibration coefficients 3	SM	OC3	Data header is different and the header is also used in FMA mode on 37XXX
OC4	Output calibration coefficients 4	SM	OC4	37XXX: Data header is different and the header is also used in FMA mode. Outputs EFT term (vs. EXF on 360B) in 12-T and 1-Path 2-Port-FWD calibrations.
OC5	Output calibration coefficients 5	SM	OC5	37XXX: Data header is different and the header is also used in FMA mode. Outputs EFT term (vs. EXF on 360B) in 12-T and 1-Path 2-Port-FWD calibrations.
OC6	Output calibration coefficients 6	SM	OC6	37XXX: Data header is different and the header is also used in FMA mode. Outputs EFT term (vs. EXF on 360B) in 12-T and 1-Path 2-Port-FWD calibrations.
OC7	Output calibration coefficients 7	SM	OC7	Data header is different and the header is also used in FMA mode on 37XXX
OC8	Output calibration coefficients 8	SM	OC8	Data header is different and the header is also used in FMA mode on 37XXX
OC9	Output calibration coefficients 9	SM	OC9	Data header is different and the header is also used in FMA mode on 37XXX
OCA	Output calibration coefficient A	SM	OCA	37XXX: Data header is different and the header is also used in FMA mode. Outputs EFT term (vs. EXF on 360B) in 12-T and 1-Path 2-Port-FWD calibrations.
OCB	Output calibration coefficient B	SM	OCB	Data header is different and the header is also used in FMA mode on 37XXX
OCC	Output calibration coefficient C	SM	OCC	37XXX: Data header is different and the header is also used in FMA mode. Outputs EFT term (vs. EXF on 360B) in 12-T and 1-Path 2-Port-FWD calibrations.

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
OCD	Output corrected data for active channel parameter	SM	OCD	Data header is different and the header is also used in FMA mode on 37XXX
OCF	Output front panel setup and calibration data	SM	OCF	Data header is different on 37XXX
OCL	Output all applicable calibration coefficients for cal type	SM	OCL	Data header is different on 37XXX
OCM	Select offset short calibration method	S	OCM	
OCS	Output internal buffer collected data	N		
ODAT	Output hard copy tabular data to GPIB	N		
ODR	Output directory listing of the floppy drive	SM	ODR	Outputs an ASCII list on 37XXX and directory information is redefined
ODRH	Output directory listing of the hard drive	N		
ODV	Output distance values for time domain	SM	ODV	Header is different and also used in FMA mode on 37XXX
OEB	Output extended status byte	SM	OEB	Outputs an ASCII integer on 37XXX and Extended Byte is redefined
OEL	Output error list	N		See 360B TST
OEM	Output extended status byte mask	N		
OFD	Output final data for active channel parameter	SM	OFD	37XXX: Data header is different and the header is also used in FMA mode. Outputs single values in single graph displays
OFF	Enter offset value for top graph of active channel	S	OFF	
OFF2	Enter offset value for bottom graph of active channel	N		
OFF2?	Output offset value for bottom graph of active channel	N		
OFF?	Output offset value for top graph of active channel	N		
OFP	Output current front panel setup	SM	OFP	Header is different on 37XXX
OFV	Output frequency values	SM	OFV	Header is different and also used in FMA mode on 37XXX
OGCFD	Output gain compression final data to GPIB	N		
OGCFV	Output gain compression frequency values to GPIB	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
OGCTXT	Output text format gain compression data to GPIB	N		
OGE	Output extended description of current GPIB error	N		
OGL	Output extended description of previous GPIB error	N		
OHDR	Output hard copy header information to GPIB	N		
OHDW	Output hardware cal data to GPIB	N		
OHGL	Output HPGL format data to GPIB	N		
OHM	Suffix sets impedance data type	N		
OID	Output instrument identification string	SM	OID	Comma separated fields on 37XXX
OLB	Output limits status byte	N		
OLM	Output limits status byte mask	N		
OM1	Output marker 1 value	SM	OM1	Outputs single value in single graph displays
OM2	Output marker 2 value	SM	OM2	Outputs single value in single graph displays
OM3	Output marker 3 value	SM	OM3	Outputs single value in single graph displays
OM4	Output marker 4 value	SM	OM4	Outputs single value in single graph displays
OM5	Output marker 5 value	SM	OM5	Outputs single value in single graph displays
OM6	Output marker 6 value	SM	OM6	Outputs single value in single graph displays
ONCP	Output number of points for current calibration	N		
ONCT	Output number of cal terms for current calibration	N		
ONDF	Output number of discrete frequencies	N		
ONE	Output number of lines in the error list	N		
ONP	Output number of points currently being measured	S	ONP	
ONPV	Output the number of power sweep power values	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
ONRM	Output stored normalization data to GPIB	N		
OPB	Output the 488.2 Status Byte value (same as *STB?)	SM	OPB	Outputs an ASCII integer on 37XXX and Primary Byte is redefined
OPSV	Output power sweep power values	N		
ORD	Output raw data for active channel parameter	SM	ORD	Header is different and also used in FMA mode on 37XXX
OS1	Output front panel setup number 1	SM	OS1	Header is different on 37XXX
OS10	Output front panel setup number 10	N		
OS11C	Output corrected S11 data	N		
OS11R	Output raw S11 data	N		
OS12C	Output corrected S12 data	N		
OS12R	Output raw S12 data	N		
OS2	Output front panel setup number 2	SM	OS2	Header is different on 37XXX
OS21C	Output corrected S21 data	N		
OS21R	Output raw S21 data	N		
OS22C	Output corrected S22 data	N		
OS22R	Output raw S22 data	N		
OS2P	Output S2P format data to GPIB	N		
OS3	Output front panel setup number 3	SM	OS3	Header is different on 37XXX
OS4	Output front panel setup number 4	SM	OS4	Header is different on 37XXX
OS5	Output front panel setup number 5	N		
OS6	Output front panel setup number 6	N		
OS7	Output front panel setup number 7	N		
OS8	Output front panel setup number 8	N		
OS9	Output front panel setup number 9	N		
OSL	Output service log	N		
OTV	Output time values for time domain	SM	OTV	Header is different and also used in FMA mode on 37XXX
OTXT	Output text format data to GPIB	N		
P1C	Select port 1 for connector specification	S	P1C	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
P1C?	Output port 1 connector type	N		
P1MMN	Set Port 1 Millimeter Wave Head to None	N		
P1MMR	Set Port 1 Millimeter Wave Head to Receiver (3741)	N		
P1MMT	Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740)	N		
P1MMX?	Output Port 1 Millimeter Wave Head type	N		
P1P?	Output approximate power level at port 1	N		
P2C	Select port 2 for connector specification	S	P2C	
P2C?	Output port 2 connector type	N		
P2MMN	Set Port 2 Millimeter Wave Head to none	N		
P2MMR	Set Port 2 Millimeter Wave Head to Receiver (3741)	N		
P2MMT	Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740)	N		
P2MMX?	Output Port 2 Millimeter Wave Head type	N		
PBL	Select 1/4 size plot bottom left corner	S	PBL	
PBR	Select 1/4 size plot bottom right corner	S	PBR	
PCP	Select measurement phase polar chart mode	S	PCP	
PCS	Select sweep position polar chart mode	S	PCS	
PCX?	Output polar chart mode	N		
PDR	Print directory listing of the floppy drive	N		
PDRH	Print directory listing of the hard drive	N		
PEL	Print the error list	N		
PFL	Select full-size plot	S	PFL	
PFS	Print full screen image	S	PFS	
PGR	Print graph area screen image	S	PGR	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
PGT	Plot graticule	S	PGT	
PHA	Select phase display for active channel	S	PHA	
PHO	Enter phase offset for display channel	S	PHO	
PHO?	Output phase offset for display channel	N		
PLD	Plot data area only	S	PLD	
PLG	Select log polar display for active channel	S	PLG	
PLH	Plot header	S	PLH	
PLM	Plot markers and limits	S	PLM	
PLO?	Output plot mode portrait or landscape	N		
PLR	Select linear polar display for active channel	S	PLR	
PLS	Plot entire screen	S	PLS	
PLT	Plot data traces only	S	PLT	
PMK	Print tabular data for Markers	S	PMK	
PMN	Plot menu	S	PMN	
PMT	Print tabular data for traces and markers	S	PMT	
PORT	Select portrait mode for output plot	N		
POW	Select power out display for active channel	N		
PRT?	Perform printer test and output status	N		
PS	Suffix sets time data type and scales by 1E02	N		Same as PSC
PSC	Suffix sets time data type and scales by 1E02	S	PSC	
PSET	Enter target power for gain compression receiver cal	N		
PSET?	Output target power for gain compression receiver cal	N		
PSL	Print the service log	N		
PSP	Enter number of power sweeps for flat power correction (obsolete)	S	PSP	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
PSP?	Output number of power sweeps for flat power correction (obsolete)	N		
PST	Stop print/plot	S	PST	
PSTEP	Enter power sweep step size	N		
PSTEP?	Output power sweep step size	N		
PSTOP	Enter power sweep stop power	N		
PSTOP?	Output power sweep stop power	N		
PSTRT	Enter power sweep start power	N		
PSTRT?	Output power sweep start power	N		
PSWC	Perform power sweep linearity calibration	N		
PSWC0	Turn power sweep linearity calibration off	N		
PSWC1	Turn power sweep linearity calibration on	N		
PSWCX?	Output power sweep linearity calibration on/off status	N		
PSWP0	Turn power sweep off	N		
PSWP1	Turn power sweep on	N		
PSWPX?	Output power sweep on/off status	N		
PT0	Set tabular printout points skipped to 0	S	PT0	
PT1	Set tabular printout points skipped to 1	S	PT1	
PT2	Set tabular printout points skipped to 2	S	PT2	
PT3	Set tabular printout points skipped to 3	S	PT3	
PT4	Set tabular printout points skipped to 4	S	PT4	
PT5	Set tabular printout points skipped to 5	S	PT5	
PT6	Set tabular printout points skipped to 6	S	PT6	
PT7	Set tabular printout points skipped to 7	S	PT7	
PT8	Set tabular printout points skipped to 8	S	PT8	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
PT9	Set tabular printout points skipped to 9	S	PT9	
PTB	Print tabular data for Traces	S	PTB	
PTL	Select 1/4 size plot top left corner	S	PTL	
PTP	Enter the target power for flat power correction	N		
PTP?	Output the target power for flat power correction	N		
PTR	Select 1/4 size plot top right corner	S	PTR	
PTS	Enter number of points to be skipped during flat power correction	S	PTS	
PTS?	Output number of points to be skipped during flat power correction	N		
PW2	Enter external source power level	S	PW2	
PW2?	Output external source power level	N		
PWR	Enter internal source power level	S	PWR	
PWR?	Output internal source power level	N		
Q22	Set Millimeter Wave Band to Q Band (WR-22)	N		
RAD	Suffix sets phase data type and scales by 180/pi	N		
RC1	Recall front panel setup number 1 from memory	S	RC1	
RC10	Recall front panel setup number 10 from memory	N		
RC2	Recall front panel setup number 2 from memory	S	RC2	
RC3	Recall front panel setup number 3 from memory	S	RC3	
RC4	Recall front panel setup number 4 from memory	S	RC4	
RC5	Recall front panel setup number 5 from memory	N		
RC6	Recall front panel setup number 6 from memory	N		
RC7	Recall front panel setup number 7 from memory	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
RC8	Recall front panel setup number 8 from memory	N		
RC9	Recall front panel setup number 9 from memory	N		
RD	Remove a disk directory	N		
RDA	Select automatic reference delay calculation	S	RDA	
RDD	Enter reference delay in distance for active channel	S	RDD	
RDD?	Output reference delay in distance for active channel	N		
RDT	Enter reference delay in time for active channel	S	RDT	
RDT?	Output reference delay in time for active channel	N		
RECALL	Recall a data file from disk to a task	N		
REF	Enter reference line for top graph of active channel	S	REF	
REF2	Enter reference line for bottom graph of active channel	N		
REF2?	Output reference line for bottom graph of active channel	N		
REF?	Output reference line for top graph of active channel	N		
REL	Select real display for active channel	S	REL	
REU	Suffix sets real data type	S	REU	
RGZ	Select reflective device greater than Z0	S	RGZ	
RH0	Select RF off in hold mode	S	RH0	
RH1	Select RF on in hold	S	RH1	
RHX?	Output RF on/off during hold status	N		
RIM	Select real and imaginary display for active channel	S	RIM	
RLZ	Select reflective device less than Z0	S	RLZ	
RM1	Select reference plane at line 1 midpoint	S	RM1	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
ROL	Enter reflective device offset length	S	ROL	
RPC	Repeat previous calibration	S	RPC	
RPO	Enter rear panel dc voltage value	S	RPO	
RPO?	Output rear panel dc voltage value	N		
RRP	Select reference plane at reflection plane	S	RRP	
RST	Instrument reset (same as *RST)	S	RST	
RST0	Reset instrument front panel memories and reserved parameters	N		
RST1	Reset instrument and front panel memories	N		
RSTCOL	Reset color configuration to default	N		
RSTGC	Reset gain compression parameters to default	N		
RTL	Return to local	S	RTL	
RV0	Turn rear panel output voltage off	S	RV0	
RV1	Turn rear panel output voltage on	S	RV1	
RV1?	Output rear panel output voltage on/off status	N		
RVD	Set rear panel output mode to dc value	N		
RVH	Set rear panel output mode to horizontal	S	RVH	
RVL	Set rear panel output mode to lock direction	S	RVL	
RVV	Set rear panel output mode to vertical	S	RVV	
RVX?	Output rear panel output mode	N		
S	Suffix sets time data type	N		
S11	Measure S11 on active channel	S	S11	
S12	Measure S12 on active channel	S	S12	
S21	Measure S21 on active channel	S	S21	
S22	Measure S22 on active channel	S	S22	
SA1	Enter port 1 source attenuator value	S	SA1	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
SA1?	Output port 1 source attenuator value	N		
SAMP2	Use 2 samplers for measurements	N		
SAMP3	Use 3 samplers for measurements	N		
SAMP?	Output the number of samplers used for measurements	N		
SAVE	Save a data file to disk	N		
SAVEGC	Save text format gain compression data to disk	N		
SBD	Enter substrate dielectric for microstrip calibration	S	SBD	
SBT	Enter substrate thickness for microstrip calibration	S	SBT	
SCL	Enter Scale Resolution for top graph of active channel	SM	SCL	Can also be used to scale Smith/Inverted Smith on 37XXX
SCL2	Enter Scale Resolution for bottom graph of active channel	N		
SCL2?	Output Scale Resolution for bottom graph of active channel	N		
SCL?	Output Scale Resolution for top graph of active channel	N		
SCM	Select standard calibration method	S	SCM	
SDG	Start diagnostics mode	N		
SDR	Select standard receiver mode	SM	SDR	Diagnostic Mode use only on 37XXX. Do not use for measurements
SDR?	Output receiver mode	N		
SELINT	Select Internal (normal) test set operation	N		
SELMM	Select Millimeter Wave test set operation	N		
SELSP	Select S-Parameter test set operation	N		
SELXX?	Output the test set selection MMWave/Internal	N		
SETUP	Display setup menu	N		
SFC	Perform flat test port calibration	S	SFC	
SFGCA	Select swept frequency gain compression application	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
SFGCT	Start swept frequency gain compression test	N		
SH1	Set offset short 1 or 2 offset length for offset short calibration	SM	SH1	Use WSH1 for Waveguide calibration on 37XXX
SH2	Set offset short 1 or 2 offset length for offset short calibration	SM	SH2	Use WSH2 for Waveguide calibration on 37XXX
SL1	Select source lock mode	SM	SL1	Diagnostic Mode use only on 37XXX. Do not use for measurements
SLC	Clear all segmented limits definitions	N		
SLD	Select sliding load for calibration	S	SLD	
SLH	Enter segmented limits horizontal offset	N		
SLH?	Output segmented limits horizontal offset	N		
SLL0	Turn lower segmented limits display off	N		
SLL1	Turn lower segmented limits display on	N		
SLLX?	Output lower segmented limits display on/off status	N		
SLT	Perform SLT internal calibration	N		
SLU0	Turn upper segmented limits display off	N		
SLU1	Turn upper segmented limits display on	N		
SLUX?	Output upper segmented limits display on/off status	N		
SLV	Enter segmented limits vertical offset	N		
SLV?	Output segmented limits vertical offset	N		
SMC	Enter scale and select compressed Smith Chart display	S	SMC	
SME	Enter scale and select expanded Smith Chart display	S	SME	
SMI	Select normal Smith Chart for active channel	S	SMI	
SMKR	Select marker search marker mode	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
SOF	Turn off smoothing	S	SOF	
SOF?	Output smoothing on/off status	N		
SON	Enter smoothing value and turn on	S	SON	
SON?	Output smoothing value	N		
SPAN	Enter frequency span	N		
SPAN?	Output frequency span	N		
SPD	Enter pen speed percentage	S	SPD	
SPGCA	Select swept power gain compression application	N		
SPGCT	Start swept power gain compression test	N		
SPH	Enter active segmented limit horizontal stop position	N		
SPH?	Output active segmented limit horizontal stop position	N		
SPV	Enter active segmented limit vertical stop position	N		
SPV?	Output active segmented limit vertical stop position	N		
SRC1	Select source linearity voltage testing	N		
SRC1?	Output external source 1 existence information	N		
SRC1AC	Select source 1 as active	N		
SRC1AC?	Output source 1 active/inactive status	N		
SRC1ADD	Enter external source 1 GPIB address	N		
SRC1ADD?	Output external source 1 GPIB address	N		
SRC1EX	Select source 1 as external	N		
SRC1EX?	Output source 1 external/internal status	N		
SRC1G0	Turn source 1 GPIB control off	N		
SRC1G1	Turn source 1 GPIB control on	N		
SRC1GX?	Output source 1 GPIB control on/off status	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
SRC1MOD?	Output external source 1 model/version string	N		
SRC1NA	Select source 1 as not active	N		
SRC1NT	Select source 1 as internal	N		
SRC2	Select source power voltage testing	N		
SRC2?	Output external source 2 existence information	N		
SRC2AC	Select source 2 as active	N		
SRC2AC?	Output source 2 active/inactive status	N		
SRC2ADD	Enter external source 2 GPIB address	N		
SRC2ADD?	Output external source 2 GPIB address	N		
SRC2G0	Turn source 2 GPIB control off	N		
SRC2G1	Turn source 2 GPIB control on	N		
SRC2GX?	Output source 2 GPIB control on/off status	N		
SRC2MOD?	Output external Source 2 model/version string	N		
SRC2NA	Select source 2 as not active	N		
SRCH	Enter marker search value	N		
SRCH?	Output marker search value	N		
SRT	Enter start frequency	S	SRT	
SRT?	Output start frequency	N		
ST1	Select set on mode	S	ST1	Diagnostic Mode use only on 37XXX. Do not use for measurements
STD	Store trace to memory on active channel	S	STD	
STH	Enter active segmented limit horizontal start position	N		
STH?	Output active segmented limit horizontal start position	N		
STP	Enter stop frequency	S	STP	
STP?	Output stop frequency	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
STV	Enter active segmented limit vertical start position	N		
STV?	Output active segmented limit vertical start position	N		
SV1	Save front panel setup number 1 to memory	S	SV1	
SV10	Save front panel setup number 10 to memory	N		
SV2	Save front panel setup number 2 to memory	S	SV2	
SV3	Save front panel setup number 3 to memory	S	SV3	
SV4	Save front panel setup number 4 to memory	S	SV4	
SV5	Save front panel setup number 5 to memory	N		
SV6	Save front panel setup number 6 to memory	N		
SV7	Save front panel setup number 7 to memory	N		
SV8	Save front panel setup number 8 to memory	N		
SV9	Save front panel setup number 9 to memory	N		
SVB	Save current band definitions	S	SVB	
SVBMM	Save and activate the new Millimeter Wave band definitions	N		
SWP	Return to normal sweep mode	S	SWP	
SWP?	Output sweep mode	N		
SWPDIR?	Output instantaneous sweep direction forward/reverse	N		
SWR	Select SWR display for active channel	S	SWR	
SXX?	Output s parameter or user defined parameter of active channel	N		
T13	Select overlaid channel 1 and 3 display	S	T13	
T24	Select overlaid channel 2 and 4 display	S	T24	
TA2	Enter port 2 test attenuator value	S	TA2	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
TA2?	Output port 2 test attenuator value	N		
TBP	Select time bandpass mode for active channel	S	TBP	
TC1	Take calibration data for port 1	S	TC1	
TC2	Take calibration data for port 2	S	TC2	
TCD	Take calibration data on one or both ports as necessary	S	TCD	
TCM	Select the TRM calibration method	N		
TDC	Select time domain harmonic frequency calibration data points	S	TDC	
TDDIST	Set time domain parameter to distance for active channel	N		
TDDIST?	Output active channel time domain parameter distance or time	N		
TDPI0	Turn phasor impulse response off for active channel	N		
TDPI1	Turn phasor impulse response on for active channel	N		
TDPIX?	Output phasor impulse on/off status for active channel	N		
TDTIME	Set time domain parameter to time for active channel	N		
TDX?	Output domain mode for active channel	N		
TEB	Select external trigger executes *DDT definition	N		
TEX	Select external measurement triggering	S	TEX	
TIB	Select GPIB measurement triggering	N		
TIME	Enter the system time	N		
TIME?	Output the system time	N		
TIN	Select internal measurement triggering	N		
TK1	Select tracking mode	SM	TK1	Diagnostic Mode use only on 37XXX. Do not use for measurements
TLP	Select time lowpass mode for active channel	S	TLP	

- Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
TLZ	Enter through line impedance for calibration	N		
TOL	Enter through offset length for calibration	S	TOL	
TPI	Select time phasor impulse mode for active channel	S	TPI	
TPN	Enter pen number for trace overlay data	N		
TRCCOL	Enter the color number for memory data	N		
TRCCOL?	Output the color number for memory data	N		
TRS	Trigger/restart sweep	SM	TRS	Always restarts sweep in forward direction in dual direction sweeps on 37XXX
TST	Perform self test and output status (same as *TST?)	SM	TST	37XXX executes a Self Test, outputs 1/0 (pass/fail). 360B only outputs current sweep errors
TXX?	Output trigger source	N		
U10	Select 10 mil UTF calibration kit	N		
U15	Select 15 mil UTF calibration kit	N		
U25	Select 25 mil UTF calibration kit	N		
UNDOGC	Exit gain compression and undo changes	N		
UPL0	Turn upper limit off	N		
UPL1	Turn upper limit on at current value	N		
UPL20	Turn upper limit off for bottom graph	N		
UPL21	Turn upper limit on at current value for bottom graph	N		
UPL2X?	Output upper limit on/off status for bottom graph	N		
UPLX?	Output upper limit on/off status	N		
US	Suffix sets time data type and scales by 1E-6	N		Same as USC
US1	Select upper segmented limit 1 as the active segment	S	US1	
US10	Select upper segmented limit 10 as the active segment	N		

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. *373XXA/360B Commands Compatibility*

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
US2	Select upper segmented limit 2 as the active segment	SM	US2	Completely redefined on 37XXX. Refer to 360B Programming Manual.
US3	Select upper segmented limit 3 as the active segment	SM	US3	Completely redefined on 37XXX. Refer to 360B Programming Manual.
US4	Select upper segmented limit 4 as the active segment	SM	US4	Completely redefined on 37XXX. Refer to 360B Programming Manual.
US5	Select upper segmented limit 5 as the active segment	N		
US6	Select upper segmented limit 6 as the active segment	N		
US7	Select upper segmented limit 7 as the active segment	N		
US8	Select upper segmented limit 8 as the active segment	N		
US9	Select upper segmented limit 9 as the active segment	N		
USC	Suffix sets time data type and scales by 1E-6	S	USC	
USE	Enter effective dielectric for microstrip calibration	S	USE	
USL	Enter label string for user parameter being defined	N		
USL?	Output label string for user parameter being defined	N		
USR1	Measure user parameter 1 on active channel	N		
USR2	Measure user parameter 2 on active channel	N		
USR3	Measure user parameter 3 on active channel	N		
USR4	Measure user parameter 4 on active channel	N		
USW	Enter microstrip width for microstrip calibration	N		
USZ	Enter microstrip impedance for microstrip calibration	N		
V	Suffix sets voltage data type	N		Same as VLT
V15	Set Millimeter Wave Band to V Band (WR-15)	N		
VLT	Suffix sets voltage data type	S	VLT	
VSP	Enter rear panel stop voltage value	S	VSP	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
VSP?	Output rear panel stop voltage value	N		
VST	Enter rear panel start voltage value	S	VST	
VST?	Output rear panel start voltage value	N		
W10	Set Millimeter Wave Band to W Band (WR-10)	N		
W10E	Set Millimeter Wave Band to extended W Band (WR-10E)	N		
WCO	Enter waveguide cutoff frequency for user defined kit	S	WCO	
WFS	Wait full sweep until all display data is valid	SM	WFS	Issue twice for first DUT sweep in 12T-cal on 37XXX.
WIDE	Use entire display width for graphs	N		
WKD	Select user defined waveguide calibration kit	S	WKD	
WKI	Select installed waveguide calibration kit	S	WKI	
WLS	Select low sidelobe window shape	S	WLS	
WMS	Select minimum sidelobe window shape	S	WMS	
WNM	Select nominal window shape	S	WNM	
WRT	Select rectangular window shape	S	WRT	
WSH1	Enter waveguide short offset 1 for user defined kit	N		Same as SH1 on 360B.
WSH2	Enter waveguide short offset 2 for user defined kit	N		Same as SH2 on 360B.
WSX?	Output window shape	N		
XM3	Suffix sets unitless data type and scales by 1E-3	S	XM3	
XMKR?	Output marker mode	N		
XSB?	Output byte order for output data LSB or MSB	N		
XX1	Suffix sets unitless data type	S	XX1	
XX3	Suffix sets unitless data type and scales by 1E3	S	XX3	
ZCT	Enter zoom range center value time or distance	S	ZCT	

• Refer to compatibility Code descriptions at bottom of page C-9.

Table C-1. 373XXA/360B Commands Compatibility

Command	Description	Compatibility Code	360B Commands	Compatibility/Modification Remarks
ZCT?	Output zoom range center value	N		
ZSN	Enter zoom range span value time or distance	S	ZSN	
ZSN?	Output zoom range span value	N		
ZSP	Enter zoom range stop value time or distance	S	ZSP	
ZSP?	Output zoom range stop value	N		
ZST	Enter zoom range start value time or distance	S	ZST	
ZST?	Output zoom range start value	N		

* Refer to compatibility Code descriptions at bottom of page C-9.

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